

A Health Literacy Report: Analysis of 2016 BRFSS Health Literacy Data

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Executive Summary

This report analyzed data generated by a first attempt to scale up population surveillance of health literacy in the context of large scale public health data collection. The data derived from a 3-question optional health literacy module authorized for inclusion in the Behavioral Risk Factor Surveillance System (BRFSS/HL). In 2016, 17 states administered the health literacy module to a sample of 63,028,536 adults, after weighting. (The raw number of valid cases was 104,790; however following convention, this document reports results in terms of the larger stratified sample to which weighting formulas permit extrapolation.)

The connection between health literacy and public health is powerful. An abundance of empirical evidence links health literacy with effective disease self-care, appropriate use of health services, and recommended prevention behaviors such as vaccination, physical exercise and avoiding tobacco products. Compelling evidence also suggests that health literacy can be a factor in mitigating otherwise intractable health disparities among socially-segmented subgroups in the United States. A robust program of population-based health literacy surveillance would enable better design and targeting of public health interventions.

Items for the BRFSS/HL module were devised based on a survey of existing health literacy instruments suitable for large-scale administration. The items underwent cognitive testing. The final item set is as follows:

1. How difficult is it for you to get advice or information about health or medical topics if you needed it?
2. How difficult is it for you to understand information that doctors, nurses and other health professionals tell you?
3. You can find written information about health on the Internet, in newspapers and magazines, and in brochures in the doctor's office and clinic. In general, how difficult is it for you to understand written health information?

Data analysis of the 2016 BRFSS/HL module revealed no aberrant patterns of item nonresponse, suggesting that respondents had no difficulty with these questions. Internal consistency among the three items was satisfactory, and they were thus summed into a single HL_{TOT} scale. The distribution of HL_{TOT} scores was highly skewed in a positive direction (left skewed). About 43% of respondents indicated that all three health literacy tasks were "very easy" and thus obtained the highest possible score on the instrument. However, based on previous studies that asked people to actually perform health literacy tasks, it is clear that this self-report grossly over-estimated respondents' actual proficiency. Therefore, the BRFSS/HL is deemed unacceptable for determining the prevalence of health literacy levels. In addition, the distribution restricted variance and limited the utility of HL_{TOT} for planned multiple regression analyses.

On the other hand, when dichotomized through a median split, health literacy scores yielded illuminating bivariate associations with selected demographic variables and selected health status and health behavior variables. For example, results confirmed previous findings showing that men, Spanish speakers, and persons with less schooling are at risk of low health literacy. However, results also revealed that currently married individuals and employed individuals were likely to belong to the higher health literacy group. Black Americans were one minority group that had equal probability of highest health literacy, relative to white Americans. Health literacy was associated with days of poor health and with chronic disease burden, as well as with health protective behaviors such as seat belt use, tobacco avoidance, and health insurance coverage.

The report recommends continued development of a BRFSS health literacy module that might more adequately discriminate among levels of health literacy. It points to ways in which the results warrant using health literacy best practices in crafting campaigns for driver safety, tobacco control, and moderate alcohol consumption, since these particular behaviors evinced a strong association with health literacy. The report encourages further research using the 2016 BRFSS data, for example to examine associations between health literacy and additional health status and health behavior variables, and to investigate geographic disparities within states and territories.

Introduction

For more than two decades, scientists and practitioners alike have acknowledged health literacy as a major determinant of individuals' health status and disease prevention behaviors (National Academies of Sciences, Engineering, and Medicine, 2015). But what is health literacy? Definitions of health literacy vary considerably (Sørensen, Van den Broucke, & Fullam, 2012). Some authorities and policy documents regard health literacy as a trait of individual patients and consumers. Healthy People 2020, for example, defined health literacy as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions." In contrast, one definition currently under consideration for Healthy People 2030 expands the scope of health literacy to include more social and systemic factors: "Health literacy occurs when a society provides accurate health information and services that people can easily find, understand, and use to inform their decisions and actions" (see https://www.healthypeople.gov/sites/default/files/10July2018CommitteeSlides508_1.pdf). What is common among all definitions of health literacy is that clear, accessible, and actionable information is necessary to sustain optimal health for all people.

An abundance of empirical evidence links health literacy with effective disease self-care, appropriate use of health services, and recommended prevention behaviors such as vaccination, physical exercise and avoiding tobacco products (Berkman, Sheridan, Donoghue et al, 2011; Wolf, Gazmararian & Baker 2007; see also resources posted at <https://www.cdc.gov/healthliteracy/>). Compelling evidence also suggests that health literacy can be a factor in mitigating otherwise intractable health disparities among socially-segmented subgroups in the United States (Scott, Paasche-Orlow & Wolf, 2010). When health information is delivered in a person's native language and in a culturally comfortable context, when information is presented clearly and in sufficient detail to everyone, and when that information is readily available to all, group differences in health risks and outcomes diminish.

Thus, the connection between health literacy and public health is powerful (IOM, 2014; Nutbeam, 2000; Ratzan, 2001). Making health literacy central to public health and health promotion shapes a variety of practices. Materials for public health campaigns are reviewed and tailored for usability in light of target audiences' expected levels of health literacy (Jhummon-Mahadnac, Knott & Marshall, 2012). Health literacy interventions are conducted on a community-wide basis, appropriately leveraging community assets (Baur, Martinez, Tchangalova & Rubin, 2018). Public health clinical care providers adopt best practices in patient-provider communication (Horowitz, Mayberry, Kleinman et al, 2016).

Integrating health literacy into public health practice requires corresponding surveillance (US DHSS, 2009). Systematically measuring health literacy across locales and across communities enables agencies to target interventions to populations at greatest risk due to low health literacy. Measuring health literacy across time enables agencies to assess progress in promoting health literacy. Measuring population health literacy using surveys that also index health status and prevention behaviors enables agencies to strengthen the case for health literacy as a determinant of the public's health.

Some recent studies conduct population-based surveys of health literacy in nations other than the US (Levin-Zamir, Baron-Epel, Cohen, et al, 2016; Sørensen, Pelikan, Röthlin, et al. 2015). In the United States, prior to the project described in the present report, only a single study purported to collect national, weighted data about individuals' health literacy. This was the 2003 National Assessment of Adult Literacy's (NAAL) health literacy scale (Kutner, Greenberg, Jin, et al., 2006). The NAAL health literacy scale is a composite of 28 items embedded within the larger measure of adult prose, document, and quantitative literacy. The NAAL instrument was a performance measure. That is, it consisted of tasks such as interpreting medication instructions or

calculating a family's share of health insurance premium expense. As such, the NAAL instrument was time consuming. It also required one-on-one administration by an interviewer using computer assisted personal interviewing (CAPI). The NAAL was administered to a sample of 19,000 individuals, weighted to be representative of the US adult population. Based on NAAL findings, various predictive models depend solely on demographic and geographic variables to ascribe health literacy (Martin, Ruder, Escarce, et al., 2009).

The NAAL administration resulted in the frequently cited statistic that 36% of Americans have basic or below basic health literacy. Only 12% were judged proficient in health literacy. The NAAL included questions about self-rated general health, about health insurance coverage, and about sources of health information. Each of these health items was associated with health literacy in mainly predictable ways. Healthy People 2010 adopted NAAL health literacy scores as an indicator for a health literacy objective [see https://www.cdc.gov/nchs/data/hpdata2010/hpdata2010_final_review_focus_area_11.pdf]. However, because the NAAL was administered just a single time, it was not possible to evaluate progress over time using this indicator.

As useful and as groundbreaking as was the 2003 NAAL, it was not feasible—because of its cost in administration time and personnel—to ever re-administer it as part of recurring surveillance of the nation's health literacy. Moreover, the NAAL was never administered in conjunction with a general survey of public health. Therefore, the NAAL was not helpful in linking health literacy with specific health status and health behavior variables.

A need persisted, then, for a health literacy instrument that could be administered in an economical way on a population basis, alongside a conventional survey of public health. To meet that need, many researchers have considered the suitability for large scale administration of a well-validated set of three self-report questions originally developed as a health literacy screener for VA patients (Chew, Bradley & Boyko, 2004). The original items, each with 5 response levels, are:

1. How often do you have someone help you read hospital materials?
2. How confident are you filling out medical forms by yourself?
3. How often do you have problems learning about your medical condition because of difficulty understanding written information?

This item set has been frequently adopted (and adapted) for purposes of clinical screening for low health literacy (e.g., Wynia & Osborn, 2010). An augmented version of this measure was incorporated into electronic medical records by one Veterans Health Administration region. An examination of nearly 93,000 health records indicated that annual health care costs for veterans with low health literacy was about \$32,000. For those with adequate health literacy, that annual figure was about \$17,000 (Haun, Patel & French, 2015).

Prior to the present project, a few states independently elected to administer some version of the brief health literacy screening items as optional state modules incorporated into their Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is an annual telephonic self-report survey administered to a weighted sample of over 400,000 Americans. It is designed to yield prevalence data for a variety of health conditions and disease prevention/risk behaviors (see <https://www.cdc.gov/brfss/index.html>). BRFSS results are widely regarded as reliable and valid (Pierannunzi, Hu, Balluz, et al., 2013). For example,

Kansas did administer a state-optional health literacy BRFSS module in 2012, as did Georgia, Missouri, and Nebraska in 2015. Hawaii included health literacy questions on three BRFSS administrations. The 2012 Kansas findings indicated that about 9% of the population qualified as low health literacy, and that health literacy was

associated with a variety of demographic, health status, and health behavior variables from that state's BRFSS (Chesser, Melhado, Hines, et al., 2016).

The Development of the BRFSS Health Literacy Optional Module (BRFSS/HL)

The BRFSS/HL instrument builds on the precedent of adapting the three-item health literacy screening instrument for inclusion on a population-based public health survey. CDC/OADC staff, in consultation with external subject matter experts, sought to develop an instrument that met the following criteria (Baur & Rubin, 2017):

- Reflects health literacy research literature
- Fits well with a state and population-based questionnaire on chronic diseases and health disparities
- Earns at least 80% support from states and territories to become an approved BRFSS module
- Relates to public health contexts and functions

Questions from a variety of sources were evaluated. These sources included:

- California Health Interview Survey (NHIS) 2007-2009
- Commonwealth Fund Health Care Quality Survey 2006
- Consumer Assessment of Healthcare Providers and Systems (CAHPS)
- Health Information National Trends Survey (HINTS)
- National Assessment of Adult Literacy (NAAL)
- Program for the International Assessment of Adult Competencies (PIAAC)
- State BRFSS pilot studies (e.g., Kansas, Nebraska, Georgia, Hawaii)
- Veterans Health Administration (VHA) electronic health records

Based on the criteria articulated above, seven candidate questions were selected for cognitive testing. In addition to these seven items, a preamble regarding the language in which interviewees preferred to receive health information was also tested. That is, even though the interview was administered in English, we wished any speakers who preferred a different language to answer the questions in terms of information received in that other language. The cognitive testing interview protocol employed scripted probes about interviewees' understanding of the questions. For example, the protocol asked interviewees to "Say in your own words what that question is asking you." As appropriate, the protocol tested understanding by asking questions like, "Who did you think of when the question asked about 'health professionals?'" Finally, the cognitive testing assessed advantages of several variants of questions stem, for example, asking "how easy" versus "how hard" versus "how difficult."

As a result of the cognitive testing, the language preamble was jettisoned because it was too distracting and unnecessary. The question stem "how difficult" was adopted across items. Although all seven candidate items appeared to be well understood following some minor revisions, three questions emerged as both nonproblematic and also sampling across the domains of health literacy. The three questions adopted for the BRFSS/HL were:

1. How difficult is it for you to get advice or information about health or medical topics if you needed it?
 - "Find information"
2. How difficult is it for you to understand information that doctors, nurses and other health professionals tell you?
 - "Understand oral information"

3. You can find written information about health on the Internet, in newspapers and magazines, and in brochures in the doctor's office and clinic. In general, how difficult is it for you to understand written health information?
 - “Understand written information”

The response options adopted for each item were:

- Very easy (score=4)
- Somewhat easy (score=3)
- Somewhat difficult (score=2)
- Very difficult (score=1)
- For getting advice or information, add “I don't look for health information” (score=0)
- For written information, add “I don't pay attention to written health information” (score=0)
- “Refused” and “Don't know” (interviewer entered)

In 2015 this version of the BRFSS/HL module was approved by over 80% of the state and territorial BRFSS directors, making it eligible to be included as an optional module beginning with the 2016 BRFSS.

Research Questions

The following research questions guided the data analysis for the present project:

1. Does any evidence point to lack of acceptability to respondents or other problems in administering the BRFSS/HL?
2. What is the overall distribution of BRFSS/HL scores?
3. How are BRFSS/HL scores associated with selected demographic factors?
4. How are BRFSS/HL scores associated with selected health status and health behavior variables?
5. What do BRFSS/HL scores contribute to the predictive value of selected demographic factors (social determinants) in explaining variance in selected health status and health behavior variables?

Administration of the 2016 BRFSS/HL Module

The first year that a uniform, CDC-approved health literacy module was available as an option for state BRFSS administration was 2016. To encourage a strong pilot year for the BRFSS/HL, CDC/OADC provided funding to the National Association of Chronic Disease Directors (NACDD) to recruit up to 10 states and territories to administer the module and report its results. Another objective of the NACDD project was to report back to CDC/OADC the experiences of the states that adopted this new module. The following states and territories participated in the NACDD-sponsored pilot:

1. Alaska
2. Alabama
3. DC
4. Georgia
5. Kansas
6. Minnesota
7. Nebraska
8. North Carolina
9. Oklahoma
10. Pennsylvania

Seven additional states independently administered the BRFSS/HL module. Those states were:

11. Illinois
12. Iowa
13. Louisiana
14. Maryland
15. Mississippi
16. Puerto Rico
17. Virginia

Most of the states administered the BRFSS/HL to their entire sample. Three states, however, elected to administer this module to only a portion of respondents. By doing so, they freed resources to administer other optional modules to a portion of their respondents. We used standard BRFSS procedure to make sure that HL scores were weighted correctly in these three states (see https://www.cdc.gov/brfss/annual_data/2016/pdf/2016moduleanalysis.pdf).

As a partial window on the quality of the BRFSS/HL administration, patterns of item nonresponse were examined. The issue in question is whether the BRFSS/HL posed difficulties to respondents such that they opted out of responding. Nonresponse is different than responding “I don’t know” or explicitly refusing to respond to an item. Likewise, nonresponse is different than an interviewer failing to ask one or two questions out of the module, or a respondent giving an inaudible and therefore unrecordable reply. Rather, nonresponse means dropping out of the survey, at least for the items under examination.

Investigating item nonresponse was a complex process. First, several thousand out-of-state responders had to be deleted from the data set. Out-of-state responders may have been interviewed for a given state because they were reached via a cell phone number associated with that state but had subsequently moved elsewhere while retaining their original cell phone number. Core items from out-of-state responders are

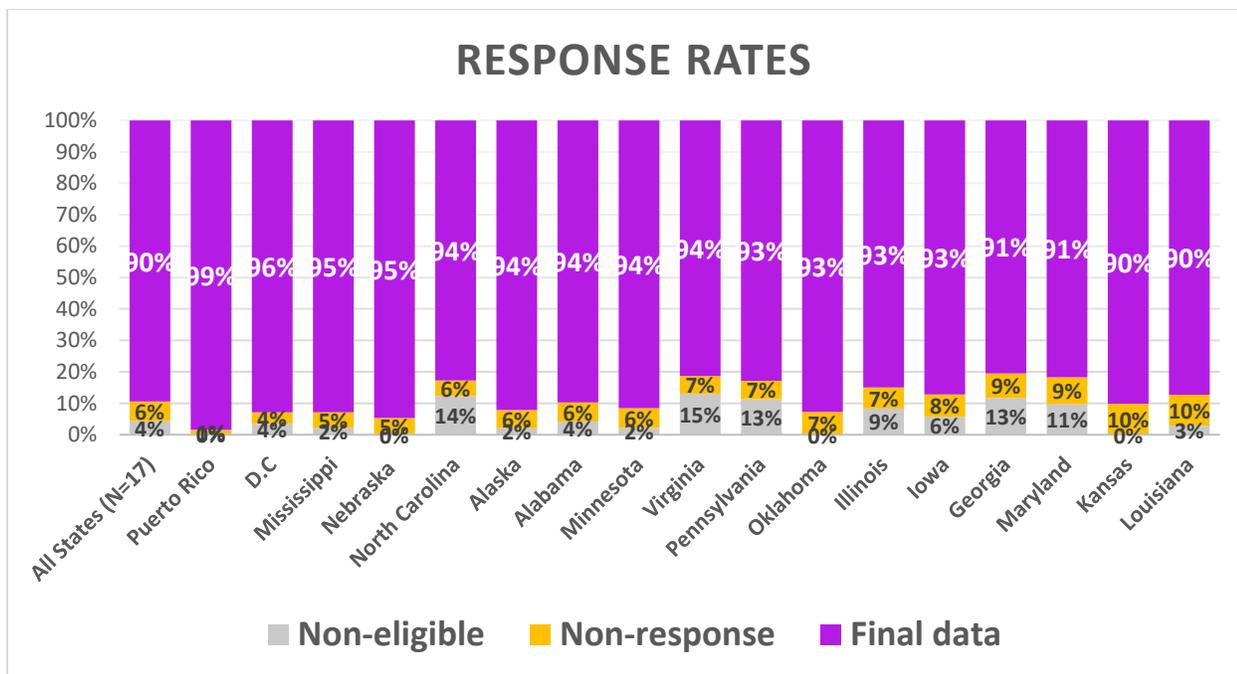
exported to their current, correct state of residence, but such responders are not even eligible for BRFSS modules. Because they were not eligible for BRFSS/HL, they do not count as true non-responders.

In addition, it is possible that an interviewer may have neglected to ask one of the three BRFSS/HL questions, or a respondent may have given an inaudible response. These sporadic missing variables were not counted as nonresponse either. Only an individual who responded to none of the three items was counted.

A flow diagram indicating how sample size was affected by these various forms of nonvalid or nonresponse data appears in Appendix A.

Figure 1 below shows the amount of nonresponse, thus defined, by state.

Figure 1: BRFSS/HL nonresponse by state



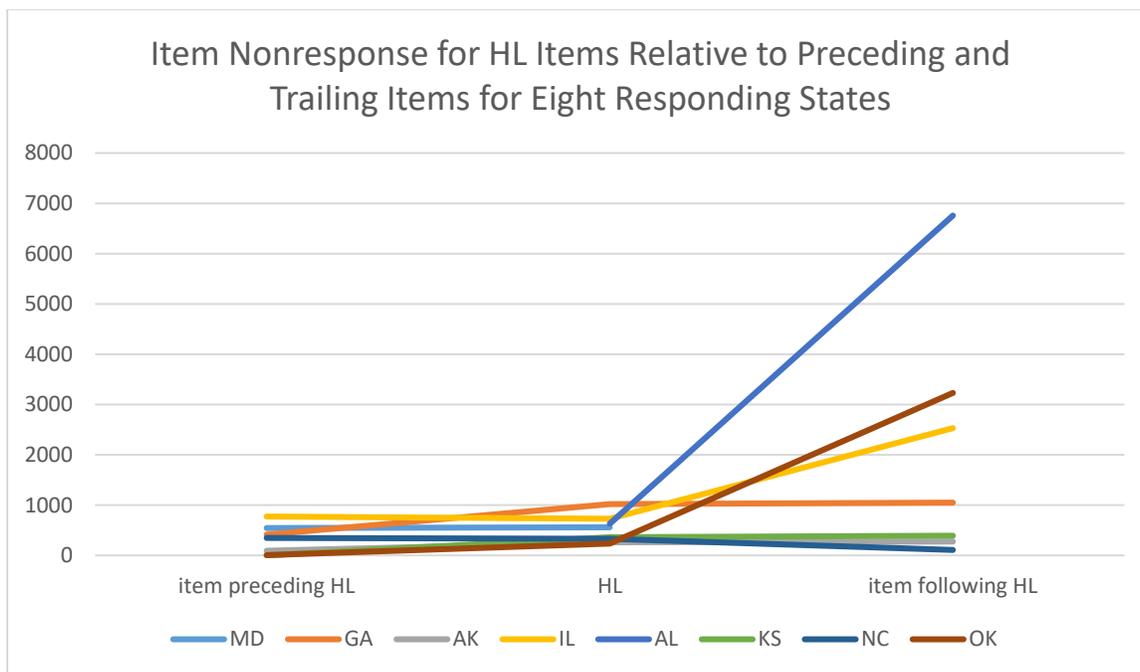
Across all states, the nonresponse rate was about 6.5% of valid cases.

- All 3 HL items have values = 93.2% (n (unweighted)=104790)
- Only 2 HL items have values = 0.2% (n=165)
- Only 1 HL item has values = 0.1% (n=101)
- Zero HL items have values = 6.5% (n=7333)

Next, it was necessary to distinguish baseline levels of nonresponse from nonresponse that was likely engendered by BRFSS/HL in particular. This was done by comparing nonresponse to the item preceding BRFSS/HL with nonresponse to BRFSS/HL, and with nonresponse to the item following BRFSS/HL. However, the order of administration for various modules was not uniform across states. Therefore, we inquired of state BRFSS coordinators which items preceded and which items followed BRFSS/HL, and we obtained nonresponse rates for those items.

Figure 2 graphically demonstrates that nonresponse for HL/BRFSS was not appreciably lower than for the preceding items, whereas nonresponse was a great deal higher for the following items (for those states in which BRFSS coordinators provided these data).

Figure 2: Nonresponse to HL module relative to preceding and succeeding items



Based on the available evidence, then, there appears to be no warrant for supposing that administration of the BRFSS/HL was any more problematic—that is, engendered higher proclivity to withhold response--than any other section of the BRFSS. Research question 1, which enquires about evidence suggesting nonresponse problems in BRFSS/HL administration, is answered in the negative.

Analysis

This analysis made use of public-facing data for the 2016 BRFSS administration (see https://www.cdc.gov/brfss/annual_data/annual_2016.html) supplemented as needed by additional data sets indicating out-of-state respondents and by a questionnaire sent to BRFSS coordinators for the 17 states that administered BRFSS/HL. CDC-determined weights were applied to the raw data, so they represented population parameters. All results reported here are weighted.

The first order of business was to assure the accuracy of the public-facing data. To do so, surveys were sent out to the BRFSS coordinators for the 17 states and territories that had administered the BRFSS/HL in 2016. The questionnaire appears in Appendix A. Most of the questionnaire is devoted to asking for frequencies for key variables such as the three health literacy items and demographic factors. The questionnaire also requested frequencies broken down by geographic regions and information about the order in which the BRFSS/HL module was administered, since that information is not available on the public-facing data sets. After two reminders, the response rate for the state and territory questionnaires was 10/17 or about 60%.

Frequencies for the key variables run from the public-facing data were compared to frequencies reported by the state and territory coordinators. Meaningful discrepancies were not found in any instance. Therefore, the public-facing data were regarded as accurate.

Once the public facing data were authenticated against state data, a second procedure ascertained whether scores on the three health literacy items could be summed into a single composite scale, HL_{tot} . A unitary composite scale was a better option than tripling the number of analyses (and the attendant chances of family-wise error) by treating each item as a separate variable. Toward that end, the SPSS (Version 15) RELIABILITY procedure was used to analyze 80,640 raw or 55,130,312 weighted complete BRFSS/HL responses.

The overall internal consistency reliability (Cronbach's alpha) was .733, which is generally considered adequate in for social science applications (Babbie, 2013). Table 1 presents associated descriptive statistics regarding the three items and the composite scale.

Table 1: Descriptive statistics for evaluating the internal consistency reliability of HL_{tot}

	Mean	Std. Deviation	N
medadvic2	1.2882	.57515	80640
undrstnd2	1.4110	.61499	80640
written2	1.4333	.64968	80640

Inter-Item Correlation Matrix

	medadvic2	undrstnd2	written2
medadvic2	1.000	.437	.381
undrstnd2	.437	1.000	.591
written2	.381	.591	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
medadvic2	2.8442	1.272	.458	.214	.742
undrstnd2	2.7214	1.038	.623	.401	.549
written2	2.6991	1.018	.577	.368	.607

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
4.1324	2.197	1.48220	3

The item-total correlations indicate that each item is moderately and positively associated with the total. The scale variance—a desirable trait for an instrument intended to discriminate among skill levels—with all three items included is just about twice the variance if any of the items were excluded. Moreover, an exercise was undertaken wherein the regression of total number of poor physical and mental health was re-run using each of the three individual items rather than the composite HL_{tot}. (See Appendix C for details of that analysis.) The exercise indicated that none of the three individual items could explain variance in the dependent variable as adequately as could HL_{tot}. Thus, there was ample rationale for summing the three items into a composite HL_{tot} scale with a theoretic range of 0-12.

For some analyses, it was necessary to dichotomize composite health literacy scores rather than treating it as a continuous variable. The results section of this report, below, details the distribution of HL_{tot} scores. As it indicates, the measure turned out to be highly skewed to the left. In fact, 42.7% of respondents gave the highest possible response on all three questions, for a HL_{tot} score of 12. That distribution precluded characterizing the scores as “proficient,” “adequate,” “basic,” and “less than basic” --as the NAAL had established as a standard way of talking about levels of health literacy in America. Instead, for purposes of establishing bivariate associations between health literacy and other BRFSS variables, HL_{tot} needed to be dichotomized.

But on what basis should health literacy be dichotomized? Three possible methods of dichotomization were considered. The first method—which was eventually adopted—was a simple median split. A median split in this instance meant that scores of 12 were “highest” and all other scores were “less than highest.” Alternative analysis B eliminated the 43% of respondents who simply gave themselves the highest possible score on all three HL items. The median split was recalculated among the remaining 36,115,871 (weighted sample size) respondents. Alternative analysis C compared respondents scoring at or below the 36th percentile versus all other respondents. The rationale for this cut-off is that population-based estimates derived from surveys like the 2003 NALS concluded that 36% of the populations possesses basic or below basic health literacy.

To compare the efficacy of those three methods of dichotomization, each was utilized in bivariate analyses of 15 BRFSS health status and health behavior variables. (See table 5 below for the analysis using the true median split.) The pattern of results among the three alternative analyses was essentially the same. Because the simple median split (Alternative A) is the most conventional and most economical to explain, it was selected as the method for dichotomizing HL_{tot} in the remainder of this report.

Statistical analyses utilizing BRFSS/HL scores consisted of four phases.

1. Descriptive statistics and frequency distribution
2. Bivariate associations between health literacy and eight selected demographic variables (age, sex, race/ethnicity, education, income, employment, marital status, and language in which BRFSS was administered). These variables were selected because they represented some social determinants of health. Because data for all these variables were collected as categorical rather than continuous variables, and because dichotomized (media split) health literacy scores were used, crosstabs or contingency tables were constructed. The significance of each bivariate association was tested via the χ^2 statistic. Odds ratios were calculated to ascertain effect sizes.
3. Bivariate associations between health literacy and 15 selected health status indicators and health protection behaviors. Eight of these 15 outcome variables were collected as categorical rather than continuous variables, and because dichotomized (media split) health literacy scores were used, crosstabs or contingency tables were constructed in these eight instances. The significance of each bivariate association was tested via the χ^2 statistic. Odds ratios were calculated to ascertain effect sizes. For the 7 outcome variables that were continuous variables, t-tests comparing highest versus less than highest health literacy groups were conducted. Cohen’s d statistic was calculated for each of these 7 comparisons as an indicator of effect size.
4. Regressions were run to ascertain the predictive power of HL_{tot} ,-- treated in these regressions as a continuous variable rather than dichotomized. Separate regressions were run for each of the 15 selected health status indicators and health protection behaviors. Logistic regressions were run for the 8 dependent variables that were categorical. Linear regressions were calculated for the 7 dependent variables that were continuous. For each regression analysis, a model was run first without HL_{TOT} at Step 1, and then forcing HL_{TOT} into the equation at Step 2. At both Step 1 and Step 2 the 8 selected demographic variables—representing social determinants of health—were forced into the equations. In this way it was possible to ascertain the increment of variance explained by adding in health literacy as a predictor, along with social determinants of health.

To simplify some analyses and to reduce their number, transformations were undertaken on certain demographic variables and dependent variables. They are as follows:

- A chronic disease index was created by summing the number of 11 chronic diseases for which a respondent reported having been diagnosed. The resulting index could range from 0-11. The diseases included were the following:
 - o coronary heart disease
 - o heart attack
 - o stroke
 - o asthma
 - o skin cancer
 - o other cancer
 - o COPD
 - o Arthritis
 - o Depression
 - o kidney disease
 - o diabetes

- To reduce the number of race and ethnicity categories to a more manageable number, the following were combined:
 - o Multiracial + “other”
 - o Asian + Pacific Islander + Native Hawaiian
 - o American Indian + Native Alaskan

- To reduce the number of marital status categories to a more manageable number, the analysis combined Divorced + Widowed + Separated

- To make the alcoholic consumption variable more transparent, data from the drinks per week responses and drinks per month responses were transformed to the same time scale, average drinks per day
 - Certain dependent variables had four ordinal categories. To make them work as criterion variables in logistic regression analyses, it was necessary to reduce those four categories to two. This dichotomization operation was done for the logistic regressions of general health and seat belt use.

Results

I. What was the distribution of HL_{tot} scores?

Table 2 presents basic descriptive statistics for HLTOT. The most evident characteristic of HLTOT is the extreme skew. The skewness statistic exceeds the value of “1,” which is a rule-of-thumb indicator for a highly skewed distribution (see <https://www.spcforexcel.com/knowledge/basic-statistics/are-skewness-and-kurtosis-useful-statistics>). That skewness is confirmed by the frequency distribution portrayed in table 3 and figure 3, below. For parallel descriptive statistics for each state individually, see Appendix D.

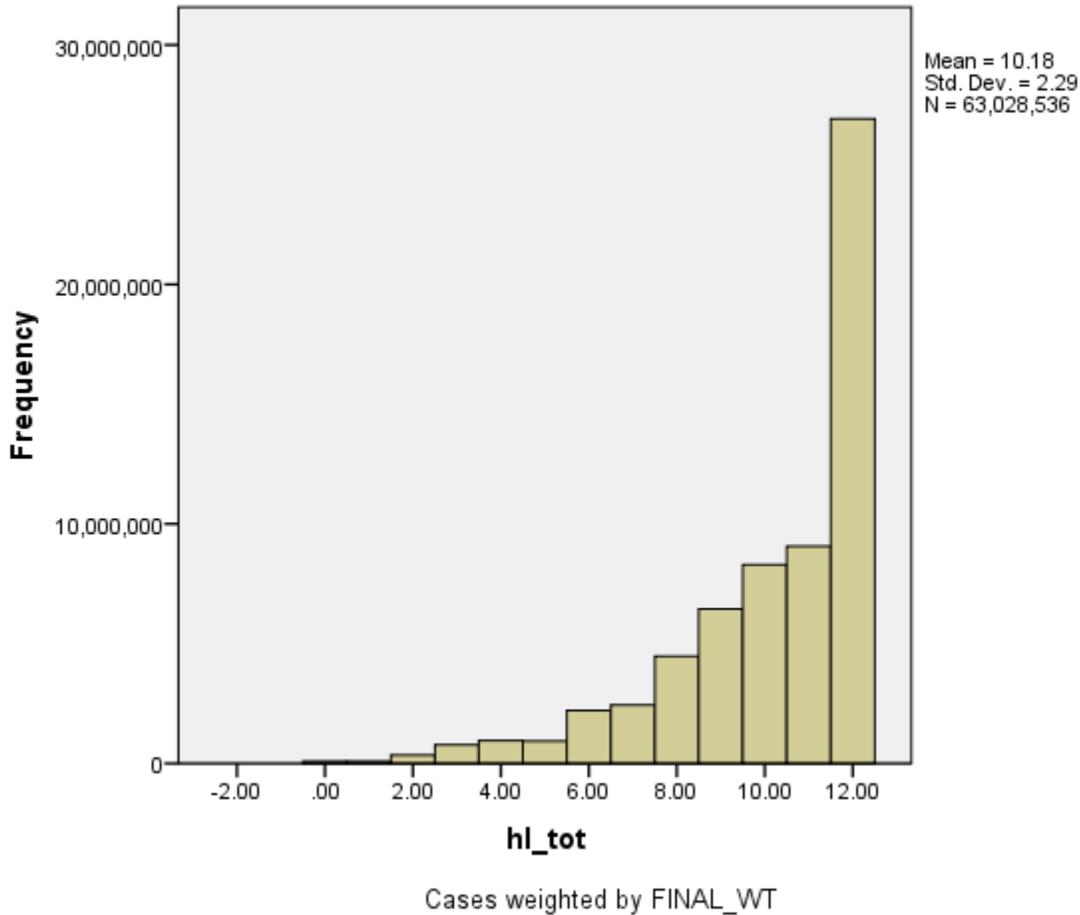
Table 2: HL_{tot} Descriptive Statistics

N	Valid	63028536
	Missing	89645
Mean		10.1753
Median		11.0000
Std. Deviation		2.29011
Variance		5.245
Skewness		-1.482
Std. Error of Skewness		.000
Kurtosis		1.964
Std. Error of Kurtosis		.001
Range		12.00
Minimum		.00
Maximum		12.00
Percentiles	25	9.0000
	50	11.0000
	75	12.0000

Table 3: Frequency distribution of HL_{tot} scores

		hl_tot			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	88762	.1	.1	.1
	1.00	94448	.1	.1	.3
	2.00	346452	.5	.5	.8
	3.00	772467	1.2	1.2	2.1
	4.00	956039	1.5	1.5	3.6
	5.00	928087	1.5	1.5	5.1
	6.00	2204880	3.5	3.5	8.6
	7.00	2442788	3.9	3.9	12.4
	8.00	4476529	7.1	7.1	19.5
	9.00	6443714	10.2	10.2	29.8
	10.00	8298287	13.1	13.2	42.9
	11.00	9063418	14.4	14.4	57.3
	12.00	26912665	42.6	42.7	100.0
	Total	63028536	99.9	100.0	
	Missing	System	89645	.1	
Total		63118182	100.0		

Figure 3: Histogram of HL_{tot} scores



The modal value is the highest possible data point, 12. This score of 12 also defines those respondents who fall above the median (11) in terms of a median split. This configuration suggests a kind of “ceiling effect” for the measure. That is, HLTOT questions elicited high self-assessments of health literacy among respondents. They apparently provided insufficient discrimination among levels of health literacy. In this sense, HLTOT proved inadequate as a measure of health literacy prevalence.

Notwithstanding its skewed distribution, HLTOT did evince reasonable variance. Note that the standard distribution, 2.29, falls only a little short of the rule-of-thumb that says a standard deviation is about $\frac{1}{4}$ of the range of scores (see https://www.tutorialspoint.com/statistics/range_rule_of_thumb.htm). Thus, the variance in this distribution—together with the robustness of most regression procedures against violations of normality assumptions—suggests that HLTOT could be eligible to function as a predictor in regression analyses.

II. How did states rank in (a) percent of respondents above the national median and in (b) mean HL_{tot} scores? What was the correlation between these two ways of ranking states?

As mentioned in the preceding section on descriptive statistics, the median split for HLTOT placed the 43% of respondents with the highest possible score, 12, above the median. All others fell below the median. Does this median split classification distort the portrait of health literacy among each of the states administering the BRFSS/HL module? To investigate that question, the 17 administering states were rank ordered according to the percentage of their respective respondents falling above the national median score. They were also rank ordered according to their respective

Table 4: Percent HL_{tot} scores above national median and mean HL_{tot} scores by state

State	High HL percent	rank	mean	rank order correlation
D.C.	54.70%	1	10.84	-0.754
North Carolina	47.40%	2	10.34	
Mississippi	47.10%	3	10.33	
Minnesota	46.80%	4	10.38	
Oklahoma	46.10%	5	10.07	
Maryland	44.60%	6	10.31	
Louisiana	44.40%	7	10.21	
Iowa	43.80%	8	10.21	
Alabama	43.60%	9	10.23	
Virginia	43.40%	10	10.34	
Alaska	41.20%	11	10.14	
Pennsylvania	41.20%	12	10.07	
Georgia	41.10%	13	10.23	
Kansas	40.90%	14	10.12	
Nebraska	40.40%	15	10.10	
Puerto Rico	39.00%	16	9.75	
Illinois	36.40%	17	9.93	

mean HLTOT scores. These data are displayed in Table 4. As the table indicates, there was high correspondence between ranks as defined by that national median and the average HLTOT score. The rank order correlation was -.75. This result indicates that the pattern imposed by the median split procedure mirrors the pattern of average total scores.

III. What are the bivariate associations between demographic variables and health literacy (median split)?

A considerable body of literature has demonstrated that health literacy is not enjoyed equally among all segments of the population. The finding of BRFSS/HL in 17 states confirms that inequality. Table 5 displays the median split associations between health literacy and 8

Table 5: Bivariate associations between dichotomized HL scores and demographic factors

Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	p - χ^2	
	N	%	N	%			
Sex							
Male	11,904,762	39.4	18,342,982	57.3	1.30	0.000	
Female	15,007,111	45.8	17,770,074	54.2	REF		
Age							
Ages 18 to 24	2,788,591	36.5	4,847,658	63.5	1.14	0.000	
Ages 25 to 34	4,310,638	43.8	5,535,454	56.2	0.84		
Ages 35 to 44	4,725,079	46.4	5,450,658	53.6	0.76		
Ages 45 to 54	4,928,700	44.8	6,075,233	55.2	0.81		
Ages 55 to 64	4,875,045	44.2	6,161,558	55.8	0.83		
Ages 65 or older	5,284,612	39.6	8,045,309	60.4	REF		
Race							
White	18,365,954	44.7	22,726,336	55.3	REF	0.000	
Black					1.01		
	4,675,421	44.5	5,830,499	55.5			
American Indian or Alaskan Native	308,185	42.2	422,796	57.8	1.11		
Asian, Pacific Islander, Native Hawaiian	622,815	34.6	1,178,882	65.4	1.53		
Hispanic	2,198,692	30.6	4,996,479	69.4	1.84		
Multiracial, and other races	443,602	44.6	550,641	55.4	1.00		
Marital Status							
Married	15,074,839	47.0	17,004,900	53.0	REF		0.000
Divorced/Widowed/Separated	4,966,501	38.1	8,084,938	61.9	1.44		
Never married	5,757,329	38.5	9,185,787	61.5	1.41		
A member of an unmarried couple	998,016	37.4	1,668,680	62.6	1.48		
Level of Education Completed [Var:EDUCAG]							
Did not graduate High School	1,837,275	21.5	6,725,225	78.5	REF	0.000	
Graduated High School	6,355,435	34.3	12,168,890	65.7	0.52		
Attended College or Technical School	9,112,005	47.0	10,279,920	53.0	0.31		
Graduated from College or Technical School	9,567,399	58.3	6,835,805	41.7	0.20		
Employment Status [Var:EMPLOY1]							
Employed for wages	14,376,828	47.7	15,768,975	52.3	0.40	0.000	
Self-employed	2,284,471	43.3	2,987,540	56.7	0.47		
Out of work for 1 year or more	547,091	34.1	1,056,846	65.9	0.70		
Out of work for less than a year	586,851	36.3	1,031,802	63.7	0.63		
A homemaker	1,509,753	38.8	2,378,879	61.2	0.57		
A student	1,285,789	37.6	2,134,447	62.4	0.60		
Retired	4,922,418	41.2	7,022,044	58.8	0.51		
Unable to work	1,261,879	26.5	3,508,130	73.5	REF		
Income Level [Var:INCOME2]							
Less than \$10,000	889,402	27.1	2,397,975	72.9	REF	0.000	
\$10,000 to 14,999	806,449	28.8	1,991,133	71.2	0.92		
\$15,000 to 19,999	1,414,049	30.9	3,156,570	69.1	0.83		
\$20,000 to 24,999	1,645,049	32.3	3,450,710	67.7	0.78		
\$25,000 to 34,999	2,096,872	38.2	3,390,089	61.8	0.60		
\$35,000 to 49,999	3,095,779	42.4	4,197,632	57.6	0.50		

\$50,000 to 74,999	3,910,417	47.1	4,398,054	52.9	0.42	
\$75,000 or more	9,632,550	56.3	7,468,364	43.7	0.29	
Don't know/Not sure	1,574,429	30.8	3,536,682	69.2	0.83	
Language [Var:QSTLANG]						
English	25,595,322	43.9	32,745,069	56.1	0.50	0.000
Spanish	1,317,344	28.1	3,370,802	71.9	REF	

demographic variables implicated in social determinants of health and recorded on the BRFSS. Chi² statistics were calculated, and the significance levels are reported in the right-most column. In each case, the associations with health literacy were statistically significant. As a means of indicating effect sizes, odds ratios were calculated using least squares regression. Parallel analyses of bivariate associations between health literacy (median split) and demographic variables within each of the 17 states and territories separately appear in Appendix D. Among the highlights of this analysis for the aggregated national sample are the following findings:

- Sex was associated with health literacy. Relative to women, men were 30% more likely to have health literacy scores below the median.
- Except for young adults, older adults were more likely to experience lower health literacy. Relative to respondents over the age of 65, most age groups were about 15% more likely to be above the median in health literacy; the one exception were youths 18-24, who were 14% more likely to have lower health literacy, again relative to adults over the age of 65.
- Some minority groups had a greater likelihood of experiencing lower health literacy. Relative to self-identified white persons, Asian Americans and Pacific Islanders and Native Hawaiians were about 50% more likely to fall into the lower health literacy grouping.
- Relative to white persons, Hispanic Americans were about 80% more likely to fall into the low literacy grouping.
- Not all minority groups displayed a higher likelihood of experiencing lower health literacy. Black Americans and multiracial individuals did not differ appreciably from white persons in terms of health literacy classification.
- Married individuals were least likely to fall below the median in health literacy. Relative to presently married individuals, adults with other marital status were at least 40% more likely to fall into the lower health literacy grouping.
- Education was associated with health literacy. Relative to individuals who never graduated high school, high school graduates were half as likely to experience lower health literacy, whereas college graduates are 80% less likely to experience lower health literacy.
- Employment status was associated with health literacy. Relative to those who were unable to work, individuals who worked for wages were 60% less likely to experience lower health literacy. Even those who had been unemployed for a year or more were 30% less likely to fall below the median on health literacy.
- Income was associated with health literacy. There appears to be a monotonic relation such that, relative to those who earn less than \$10,000 per year, those with higher family incomes were less likely to fall below the median in health literacy. Those earning over \$75,000 per year were 70% less likely to fall below the median health literacy score.

- The language in which respondents asked interviewers to administer the BRFSS was associated with health literacy. Those who responded to an English language BRFSS were half as likely to fall into the low health literacy group, relative to those who requested the survey in Spanish

IV. What are the associations between health status and health behaviors and health literacy (median split)?

A prodigious literature links health literacy to health outcomes and also to engagement with various disease and injury prevention behaviors. Of the multitude of health status and behavior variables reported on the BRFSS, the present project selected 15. Table 6 reports the bivariate associations

Table 6: Bivariate associations between dichotomized HL scores and selected BRFSS health status and health behavior categorical variables

Categorical Variables	Higher Literacy N=26,912,665		Lower Literacy N=36,115,871		Odds ratio	<i>p</i> - χ^2
	N	%	N	%		
General Health Status						
Excellent	6,125,608	55.8%	4,851,918	44.2%	4.088	0.000
Very good	9,779,685	49.1%	10,142,080	50.9%	3.123	
Good	7,720,817	38.3%	12,462,301	61.7%	2.006	
Fair	2,532,505	28.6%	6,313,681	71.4%	1.299	
Poor	690,686	23.6%	2,236,648	76.4%	REF	
Have any health care coverage						
Yes	24,932,491	44.4%	31,223,944	55.6%	1.993	0.000
No	1,879,706	28.6%	4,690,761	71.4%		
Multiple Health Care Professionals						
Yes	22,760,575	44.9%	27,926,430	55.1%	1.600	0.000
No	4,100,796	33.7%	8,052,404	66.3%		
Smoke cigarettes now						
Yes	3,842,278	35.4%	7,010,877	64.6%	0.692	0.000
No	22,926,801	44.2%	28,932,375	55.8%		
Currently use chewing tobacco, snuff, or snus						
Yes	819,394	32.9%	1,668,727	67.1%	0.648	0.000
No	26,063,270	43.1%	34,412,421	56.9%		
Exercise in Past 30 Days						
Yes	21,404,738	45.7%	25,431,941	54.3%	1.630	0.000
No	5,488,716	34.1%	10,627,873	65.9%		
Adult flu shot/spray past 12 months						
Yes	11,928,290	47.7%	13,055,178	52.3%	1.404	0.000
No	14,896,221	39.4%	22,895,919	60.7%		

Frequency of seat belts use when driving or riding in a car						
Never	334,506	30.6%	759,691	69.4%	REF	
Seldom	24,085,960	44.3%	30,227,988	55.7%	1.003	0.000
Sometimes	1,647,624	34.1%	3,189,386	65.9%	0.998	
Nearly always	598,148	30.5%	1,361,520	69.5%	1.173	
Always	206,339	30.6%	466,998	69.4%	1.810	

between 8 of those BRFSS variables and health literacy, dichotomized at the median. Chi² statistics were calculated, and the significance levels are reported in the right-most column. In each case, the associations with health literacy were statistically significant. As a means of indicating effect sizes, odds ratios were calculated using least squares regression. Among the highlights of this analysis are the following findings:

- Self-reported general health status was associated with health literacy. There appears to be a monotonic relation such that, relative to those who reported themselves to be in poor health, there was increasing likelihood that one would fall into the highest health literacy category with better levels of general health. For example, relative to those who reported poor general health, those who reported excellent health were four times more likely to score above the median in health literacy.
- Health insurance coverage of any kind was associated with health literacy. Those with health insurance were about twice as likely to score above the median in health literacy as those without health insurance.
- Being served by multiple health care professionals was associated with health literacy such that those who have multiple health care providers were 60% more likely to score above the median in health literacy than are those with only one provider or none.
- Use of tobacco products was associated with health literacy. Those who smoke cigarettes, along with those who use smokeless tobacco, were at least 30% less likely to score above the median in health literacy, compared with those who did not use tobacco products.
- Exercising in the last 30 days was associated with health literacy. Those who did exercise at least once in the last 30 days were 60% more likely to be among the higher health literacy group than those who did not exercise.
- Receiving a flu shot was associated with health literacy. Those who did receive a flu shot in the last year were 40% more likely to be above the median in health literacy, relative to those who did not receive the vaccination.
- Using a seat belt was associated with health literacy.

Table 7 continues the analysis of associations between health literacy and health status and health behavior. However, because the 7 variables in table 7 are continuous rather than

Table 7: Mean differences by dichotomized HL scores for selected BRFSS health status and health behavior continuous variables

Continuous Variables	Higher Literacy			Lower Literacy			t	p	cohen's d
	N	Mean	SD	N	Mean	SD			
Number of Days Physical Health Not Good (30 days)	26,629,769	2.97	7.31	35,321,706	4.71	9.09	834.33	0.000	0.21
Number of Days Mental Health Not Good (30 days)	26,663,060	2.87	7.04	35,432,430	4.36	8.53	749.34	0.000	0.19
Poor Physical or Mental Health (30 days)	12,284,169	3.68	7.82	20,070,608	5.55	9.50	609.45	0.000	0.21
Doctor Visits Past 12 Months (times)	10,360,899	4.74	7.26	13,408,783	5.00	8.48	-81.52	0.000	0.03
Rate of alcoholic beverage consumption in the past 30	26,577,967	0.17	0.27	35,640,156	0.14	0.25	460.22	0.000	0.12
Most drinks on single occasion past 30 days (#drinks)	14,407,899	3.41	3.25	16,476,073	3.92	4.02	387.43	0.000	0.14
Chronic disease burden index (0-11)	26,903,129	0.95	1.22	36,112,217	1.17	1.43	668.86	0.000	0.16

categorical, they needed to be analyzed via parametric statistics. Accordingly, each of the 7 variables here was subjected to t-testing. Each of the t-tests was statistically significant. The independent variable in each case was health literacy group (higher versus lower). The right-most column displays Cohen's d, a common measure of effect size. The effect sizes were small. These analyses indicate that

- Health literacy affects days of poor health.
 - Individuals with lower health literacy experience about 59% more days of poor physical health each month, compared with persons with higher health literacy.
 - Individuals with lower health literacy experience about 52% more days of poor mental health each month, compared with persons with higher health literacy.
 - Individuals with lower health literacy experience about 51% more days of poor mental or physical health each month, compared with persons with higher health literacy.
- Health literacy barely affects number of times people visit the doctor; but the effect size is quite small.
- Health literacy has an impact on use of alcohol.
 - People with higher health literacy drink on slightly more days per month than people with lower health literacy.
 - People with lower health literacy consume about 15% more drinks on a single occasion than do people with higher health literacy.
- Health literacy affects chronic disease burden such that people with lower health literacy have been diagnosed with more chronic diseases than have people with higher health literacy.

V. How well does health literacy (total score) predicting health outcomes and health behaviors after controlling for demographic factors?

A series of regressions addressed the value of BRFSS/HL for explaining variance in selected health status and health behavior indicators. Dependent variables were the 15 selected BRFSS variables analyzed in the preceding section of this report. Independent variables—predictors-- were the eight demographic factors analyzed above (i.e., gender, marital status, race/ethnicity, education, employment status, income, age, language) plus HL_{TOT}. Two separate regression models were run for each. The first was run without HL_{TOT}, that is, with the social determinants only. In the second, HL_{TOT} was added to the equation in order to ascertain the increment in total variance (R² change) accounted for.

When dependent variables were dichotomous, logistic regression was used. When those variables were continuous, linear regression was used. It should be noted that directly interpretable estimate of R^2 change exists for logistic regression; the available analogue statistics cannot be regarded as percent of variance accounted for.

In interpreting these regression results, this report focusses only on the efficacy and directionality of health literacy as a predictor. Findings for other predictors are mentioned only insofar as they help understand the magnitude of variance explained by health literacy.

The highlights of all of the following 15 regression analyses, taken as a whole, are previewed as follows:

- The full-rank regression models (including 8 demographic factors plus health literacy) were in no instance powerful predictors. The highest R^2 statistic found was for the index of chronic disease burden. For that dependent variable, the full-rank model accounted for about 25% of the variance.
- Adding health literacy to regression models that already included 8 demographic (social determinant) variables contributed less than 1% additional variance explained.
- After controlling for all 8 other demographic variables, unique variance attributable to health literacy was negligible for all variables.
- For the logistic regressions, health literacy yielded odds ratios greater than .10 or less than .90 for two dependent variables: self-rated general health and seat belt use.
- In many cases, the magnitude of the health literacy effect was similar to that of other predictors. However respondent sex, age, employment status, income, and language preference were powerful predictors, depending on dependent variable.

Table 8 conveys the results of logistic regression of general health status. Here general health status was dichotomized into good versus poor, rather than using the four ordinal categories reported in

Table 8: Logistic regression for dichotomized general health status

	Beta	S.E.	OR	p-val
Female				.000
Male	-.036	.001	.964	.000
Ages 65 or older				.000
Ages 18 to 24	-.325	.002	.722	.000
Ages 25 to 34	-.695	.002	.499	.000
Ages 35 to 44	-.912	.002	.402	.000
Ages 45 to 54	-1.055	.002	.348	.000
Ages 55 to 64	-.996	.002	.369	.000
Married				.000
Divorced/Widowed/Separated	-.016	.001	.984	.000
Never married	.062	.001	1.064	.000
Member of an unmarried couple	-.085	.002	.919	.000
White				.000

Black	-.091	.001	.913	.000
American Indian or Alaskan Native	-.215	.003	.807	.000
Asian, Pacific Islander, Native Hawaiian	.235	.003	1.265	.000
Hispanic	-.097	.002	.907	.000
Multiracial, and other races	-.187	.003	.829	.000
Did not graduate High School				.000
Graduated High School	.275	.001	1.317	.000
Attended College or Technical School	.316	.001	1.372	.000
Graduated from College or Technical School	.781	.001	2.185	.000
Unable to work				.000
Employed for wages	2.017	.001	7.516	.000
Self-employed	2.231	.002	9.313	.000
Out of work for 1 year or more	1.289	.002	3.631	.000
Out of work for less than a year	1.344	.002	3.833	.000
Homemaker	1.619	.002	5.050	.000
Student	2.199	.003	9.012	.000
Retired	1.482	.002	4.404	.000
Less than \$10,000				.000
\$10,000 to 14,999	-.133	.002	.875	.000
\$15,000 to 19,999	.076	.002	1.079	.000
\$20,000 to 24,999	.019	.002	1.019	.000
\$25,000 to 34,999	.315	.002	1.370	.000
\$35,000 to 49,999	.497	.002	1.643	.000
\$50,000 to 74,999	.735	.002	2.085	.000
\$75,000 or more	1.129	.002	3.093	.000
Don't know/Not sure	.254	.002	1.289	.000
Spanish survey requested				.000
English survey	.437	.002	1.547	.000
HL Total Score	.104	.000	1.109	.000
Constant	-1.546	.004	.213	.000
	Model 1		Model 2	
	Log likelihood	45105251.81	Log likelihood	44694652.87
	Cox & Snell R Square	0.1742	Cox & Snell R Square	0.1800
	Nagelkerke R Square	0.2806	Nagelkerke R Square	0.2900

BRFSS. (The rationale for this decision is that a variable with only 4 levels is not suitable for linear regression.)

A comparison of R^2 analogues for Model 1 (without health literacy) versus Model 2 (including health literacy) for this dependent variable appears at the bottom of table 8. That comparison reveals that total R^2 changed less than 1%. On the other hand, the odds ratio reveals that controlling for all demographic variables, for each unit of increase in health literacy, an individual is about 11% more likely to be in good health. (Note the skewed distribution of HL_{TOT} scores renders the exact magnitude of that step-up at each point in the distribution very

uncertain.) Nevertheless, that is a larger effect size than for respondent sex, but less than, for example, language preference.

Table 9 conveys the results of linear regression of the number of days (in the last 30) that respondents experienced poor physical health. A comparison of R^2 values for Model 1 (without health literacy)

Table 9: Linear regression for number of days physical health not good

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-val	R-Square (-HL)	R-Square (+HL)
	B	Std. Error	Beta				
(Constant)	6.665	.010		697.68	.000		
GENDER	-.260	.002	-.015	-121.94	.000		
MARITAL STATUS	-.099	.001	-.011	-77.17	.000		
RACE/ETHNICITY	-.063	.001	-.011	-65.27	.000		
EDUCATION	-.351	.001	-.042	-297.23	.000	0.107	
EMPLOYMENT	.697	.000	.225	1585.10	.000		0.112
INCOME	-.445	.001	-.121	-856.94	.000		
AGE	.235	.001	.047	305.70	.000		
LANGUAGE REQUESTED	1.227	.005	.039	236.65	.000		
HEALTH LITERACY TOTAL SCORE	-.289	.000	-.077	-583.01	.000		

versus Model 2 (including health literacy) for this dependent variable appears in the right-most columns of table 9. That comparison reveals that total R^2 changed less than 1%. The full-scale model—including all 9 predictors—accounts for only 11% of the variance in number of days of poor physical health. The Beta weight indicates that health literacy accounts for about 0.6% of the variance in this dependent variable. Only income and employment status are more powerful predictors. The negative sign on the regression weight for health literacy indicates an inverse relation; as health literacy increases, days of poor physical health decrease slightly.

Table 10 conveys the results of linear regression of the number of days (in the last 30) that respondents experienced poor mental health. A comparison of R^2 values for Model 1 (without health literacy)

Table 10: Linear Regression for number days mental health not good

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-val	R-Square (-HL)	R-Square (+HL)
	B	Std. Error	Beta				
(Constant)	10.490	.009		1128.79	.000		
GENDER	-1.256	.002	-.078	-604.77	.000		
MARITAL STATUS	.114	.001	.013	91.05	.000		
RACE/ETHNICITY	-.156	.001	-.028	-166.63	.000		
EDUCATION	-.191	.001	-.024	-166.15	.000	0.057	0.065
EMPLOYMENT	.344	.000	.117	804.07	.000		
INCOME	-.394	.001	-.113	-779.42	.000		
AGE	-.658	.001	-.138	-881.74	.000		
LANGUAGE REQUESTED	1.855	.005	.061	367.55	.000		

HEALTH LITERACY TOTAL SCORE	-.348	.000	-.098	-720.81	.000
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versus Model 2 (including health literacy) for this dependent variable appears in the right-most columns of table 10. That comparison reveals that total R² changed less than 1%. The full-scale model—including all 9 predictors—accounts for only 6.5% of the variance in number of days of poor physical health. The Beta weight indicates that health literacy accounts for about 0.8% of the variance in this dependent variable. Only age, income, and employment status are more powerful predictors. The negative sign on the regression weight for health literacy indicates an inverse relation; as health literacy increases, days of poor mental health decrease.

Table 11 conveys the results of linear regression of the number of days (in the last 30) that respondents experienced poor physical or mental health. A comparison of R² values for Model 1 (without health

Table 11: Linear regression for days with poor physical or mental health days

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-val	R-Square (-HL)	R-Square (+HL)
	B	Std. Error					
(Constant)	6.927	.014		505.12	.000		
GENDER	.379	.003	.021	123.13	.000		
MARITAL STATUS	-.314	.002	-.033	-171.63	.000		
RACE/ETHNICITY	-.008	.001	-.001	-5.86	.000		
EDUCATION	-.301	.002	-.034	-177.58	.000	0.134	
EMPLOYMENT	.892	.001	.282	1459.32	.000		0.141
INCOME	-.400	.001	-.107	-566.65	.000		
AGE	.145	.001	.027	132.50	.000		
LANGUAGE SPOKEN	1.235	.008	.034	159.62	.000		
HEALTH LITERACY TOTAL SCORE	-.341	.001	-.088	-488.12	.000		

Literacy) versus Model 2 (including health literacy) for this dependent variable appears in the right-most columns of table 11. That comparison reveals that total R² changed less than 1%. The full-scale model—including all 9 predictors—accounts for 14% of the variance in number of days of poor physical or mental health. The Beta weight indicates that health literacy accounts for about 0.8% of the variance in this dependent variable. Only income and employment status are more powerful predictors. The negative sign on the regression weight for health literacy indicates an inverse relation; as health literacy increases, days of poor physical and mental health decrease.

Table 12 conveys the results of logistic regression of health insurance coverage (a dichotomous

Table 12: Logistic regression for +/- health insurance coverage

	Beta	S.E.	OR	p-val
Female				.000
Male	-.424	.001	.655	.000
Ages 65 or older				.000
Ages 18 to 24	-.276	.002	.759	.000
Ages 25 to 34	-.163	.002	.850	.000

Ages 35 to 44	.157	.002	1.170	.000
Ages 45 to 54	.634	.002	1.886	.000
Ages 55 to 64	2.297	.003	9.945	.000
Married				.000
Divorced/Widowed/Separated	-.264	.001	.768	.000
Never married	-.115	.001	.891	.000
Member of an unmarried couple	-.400	.002	.671	.000
White				.000
Black	-.300	.001	.741	.000
American Indian or Alaskan Native	-.110	.004	.896	.000
Asian, Pacific Islander, Native Hawaiian	-.092	.003	.912	.000
Hispanic	-.490	.002	.613	.000
Multiracial, and other races	-.055	.004	.946	.000
Did not graduate High School				.000
Graduated High School	.683	.001	1.980	.000
Attended College or Technical School	.932	.001	2.540	.000
Graduated from College or Technical School	1.478	.002	4.385	.000
Unable to work				.000
Employed for wages	-.671	.002	.511	.000
Self-employed	-1.609	.002	.200	.000
Out of work for 1 year or more	-1.131	.003	.323	.000
Out of work for less than a year	-1.245	.003	.288	.000
Homemaker	-1.034	.002	.356	.000
Student	-.365	.003	.694	.000
Retired	-.132	.003	.876	.000
Less than \$10,000				.000
\$10,000 to 14,999	.002	.002	1.002	.361
\$15,000 to 19,999	-.158	.002	.854	.000
\$20,000 to 24,999	-.049	.002	.952	.000
\$25,000 to 34,999	.244	.002	1.276	.000
\$35,000 to 49,999	.543	.002	1.721	.000
\$50,000 to 74,999	1.036	.002	2.817	.000
\$75,000 or more	1.811	.003	6.115	.000
Don't know/Not sure	.118	.002	1.125	.000
Spanish survey requested				.000
English	-.164	.002	.849	.000
HL Total Score	.079	.000	1.083	.000
Constant	1.180	.004	3.254	.000
	Model 1		Model 2	
	Log likelihood	30478738.81	Log likelihood	30309061.83
	Cox & Snell R Square	0.1427	Cox & Snell R Square	0.1453
	Nagelkerke R Square	0.2890	Nagelkerke R Square	0.2941

variable). A comparison of R^2 analogues for Model 1 (without health literacy) versus Model 2 (including health literacy) for this dependent variable appears at the bottom of table 12. That comparison reveals that total R^2 changed less than 1%. On the other hand, the odds ratio reveals that controlling for all demographic variables, for each unit of increase in health literacy, an individual is about 8% more likely to possess health insurance. (Note the skewed distribution of HL_{TOT} scores renders the exact magnitude of that step-up at each point in the distribution very uncertain.) That is a smaller effect size than for respondent sex or language preference, for example.

Table 13 conveys the results of linear regression of the number of occasions (in the last year) that respondents visited a doctor. A comparison of R^2 values for Model 1 (without health

Table 13 Linear Regression for visits to doctors' office in the past 12 months

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-val	R-Square (-HL)	R-Square (+HL)
	B	Std. Error					
(Constant)	2.089	.018		114.09	.000		
GENDER	-.741	.003	-.046	-216.62	.000		
MARITAL STATUS	-.028	.002	-.003	-13.64	.000		
RACE/ETHNICITY	-.179	.001	-.027	-120.00	.000		
EDUCATION	.243	.002	.030	128.64	.000	0.039	
EMPLOYMENT	.488	.001	.167	694.86	.000		0.039
INCOME	-.109	.001	-.030	-129.16	.000		
AGE	.085	.001	.018	68.92	.000		
LANGUAGE REQUESTED	1.471	.014	.024	104.60	.000		
HEALTH LITERACY TOTAL SCORE	.017	.001	.005	21.25	.000		

Literacy) versus Model 2 (including health literacy) for this dependent variable appears in the right-most columns of table 13. That comparison reveals zero R^2 change. The full-scale model—including all 9 predictors—accounts for less than 4% of the variance in number of doctors' visits. The Beta weight indicates that health literacy accounts for virtually none of the variance in this dependent variable, despite the statistical significance of the regression line. Only marital status is a less potent predictor of visits to doctors' offices.

Table 14 conveys the results of the logistical regression on use of multiple health care providers,

Table 14: Logistic regression for +/- have multiple health care professionals

	Beta	S.E.	OR	p-val
Female				.000
Male	-.739	.001	.478	.000
Ages 65 or older				.000
Ages 18 to 24	-.164	.001	.849	.000
Ages 25 to 34	.325	.001	1.384	.000
Ages 35 to 44	.850	.002	2.340	.000
Ages 45 to 54	1.279	.002	3.593	.000

Ages 55 to 64	1.907	.002	6.736	.000
Married				.000
Divorced/Widowed/Separated	-.239	.001	.787	.000
Never married	-.256	.001	.774	.000
Member of an unmarried couple	-.454	.002	.635	.000
White				.000
Black	-.031	.001	.970	.000
American Indian or Alaskan Native	-.191	.003	.826	.000
Asian, Pacific Islander, Native Hawaiian	-.324	.002	.723	.000
Hispanic	-.045	.002	.956	.000
Multiracial, and other races	-.320	.003	.726	.000
Did not graduate High School				.000
Graduated High School	.346	.001	1.413	.000
Attended College or Technical School	.463	.001	1.589	.000
Graduated from College or Technical School	.552	.001	1.736	.000
Unable to work				.000
Employed for wages	-1.058	.002	.347	.000
Self-employed	-1.230	.002	.292	.000
Out of work for 1 year or more	-1.001	.003	.367	.000
Out of work for less than a year	-1.046	.002	.351	.000
A homemaker	-1.034	.002	.356	.000
A student	-.754	.002	.470	.000
Retired	-.459	.003	.632	.000
Less than \$10,000				.000
\$10,000 to 14,999	.061	.002	1.063	.000
\$15,000 to 19,999	-.036	.002	.965	.000
\$20,000 to 24,999	.021	.002	1.021	.000
\$25,000 to 34,999	.063	.002	1.065	.000
\$35,000 to 49,999	.338	.002	1.402	.000
\$50,000 to 74,999	.453	.002	1.573	.000
\$75,000 or more	.696	.002	2.005	.000
Don't know/Not sure	.110	.002	1.116	.000
Spanish survey requested				.000
English	.055	.002	1.057	.000
HL Total Score	.088	.000	1.092	.000
Constant	.694	.003	2.002	.000

	Model 1	Model 2
Log likelihood	48669548.16	48360171.63
Cox & Snell R Square	0.1406	0.1452
Nagelkerke R Square	0.2235	0.2308

a dichotomous variable). A comparison of R^2 analogues for Model 1 (without health literacy) versus Model 2 (including health literacy) for this dependent variable appears at the bottom of table 14. That comparison reveals that total R^2 changed less than 1%. On the other hand, the odds ratio reveals that controlling for all

demographic variables, for each unit of increase in health literacy, an individual is about 9% more likely to receive services from multiple health care providers. (Note the skewed distribution of HL_{TOT} scores renders the exact magnitude of that step-up at each point in the distribution very uncertain.) That is a smaller effect size than for respondent sex or age or income, for example.

Table 15 presents the logistic regression results for current cigarette smoking (a dichotomous

Table 15: Logistic regression for current cigarette smoking

	Beta	S.E.	OR	p-val
Female				.000
Male	.276	.001	1.318	.000
Ages 65 or older				.000
Ages 18 to 24	.612	.002	1.844	.000
Ages 25 to 34	.692	.002	1.999	.000
Ages 35 to 44	.509	.002	1.664	.000
Ages 45 to 54	.297	.002	1.346	.000
Ages 55 to 64	-.701	.002	.496	.000
Married				.000
Divorced/Widowed/Separated	.500	.001	1.649	.000
Never married	.338	.001	1.402	.000
Member of an unmarried couple	.666	.002	1.946	.000
White				.000
Black	-.446	.001	.640	.000
American Indian or Alaskan Native	.220	.003	1.246	.000
Asian, Pacific Islander, Native Hawaiian	-1.059	.003	.347	.000
Hispanic	-.612	.002	.542	.000
Multiracial, and other races	.356	.003	1.428	.000
Did not graduate High School				.000
Graduated High School	-.358	.001	.699	.000
Attended College or Technical School	-.596	.001	.551	.000
Graduated from College or Technical School	-1.452	.002	.234	.000
Unable to work				.000
Employed for wages	-.249	.001	.780	.000
Self-employed	-.233	.002	.792	.000
Out of work for 1 year or more	.189	.002	1.207	.000
Out of work for less than a year	.107	.002	1.113	.000
Homemaker	-.351	.002	.704	.000
Student	-1.060	.003	.346	.000
Retired	-.401	.002	.670	.000
Less than \$10,000				.000
\$10,000 to 14,999	-.185	.002	.831	.000
\$15,000 to 19,999	-.223	.002	.800	.000
\$20,000 to 24,999	-.294	.002	.745	.000

\$25,000 to 34,999	-.308	.002	.735	.000
\$35,000 to 49,999	-.413	.002	.662	.000
\$50,000 to 74,999	-.702	.002	.496	.000
\$75,000 or more	-1.033	.002	.356	.000
Don't know/Not sure	-.519	.002	.595	.000
Spanish survey requested				.000
English	1.107	.002	3.026	.000
HL Total Score	-.029	.000	.972	.000
Constant	-1.414	.004	.243	.000
	Model 1		Model 2	
	Log likelihood	47413081.27	Log likelihood	47381731.61
	Cox & Snell R Square	0.1080	Cox & Snell R Square	0.1084
	Nagelkerke R Square	0.1778	Nagelkerke R Square	0.1786

variable). A comparison of R^2 analogues for Model 1 (without health literacy) versus Model 2 (including health literacy) for this dependent variable appears at the bottom of table 15. That comparison reveals that total R^2 changed less than 1%. The odds ratio reveals that controlling for all demographic variables, for each unit of increase in health literacy, an individual is about 3% less likely to smoke. (Note the skewed distribution of HL_{TOT} scores renders the exact magnitude of that step-up at each point in the distribution very uncertain.) That is a smaller effect size than for any other variable, especially language preference.

Table 16 presents results for the logistic regression of current use of smokeless tobacco (a dichotomous

Table 16: Logistic regression for current use of smokeless tobacco

	Beta	S.E.	OR	p-val
Female				.000
Male	2.134	.002	8.445	.000
Ages 65 or older				.000
Ages 18 to 24	-.122	.003	.885	.000
Ages 25 to 34	-.345	.003	.709	.000
Ages 35 to 44	-.309	.003	.734	.000
Ages 45 to 54	-.704	.003	.495	.000
Ages 55 to 64	-.999	.004	.368	.000
Married				.000
Divorced/Widowed/Separated	.149	.002	1.161	.000
Never married	-.128	.002	.880	.000
Member of an unmarried couple	-.255	.004	.775	.000
White				.000
Black	-.747	.002	.474	.000
American Indian or Alaskan Native	.252	.005	1.286	.000
Asian, Pacific Islander, Native Hawaiian	-.643	.005	.526	.000
Hispanic	-.990	.004	.372	.000
Multiracial, and other races	-.267	.005	.766	.000

Did not graduate High School				.000
Graduated High School	-.305	.002	.737	.000
Attended College or Technical School	-.628	.002	.533	.000
Graduated from College or Technical School	-1.028	.003	.358	.000
Unable to work				.000
Employed for wages	.026	.003	1.027	.000
Self-employed	-.231	.003	.794	.000
Out of work for 1 year or more	-.457	.005	.633	.000
Out of work for less than a year	-.081	.005	.922	.000
Homemaker	-.013	.006	.987	.022
Student	-.769	.005	.464	.000
Retired	-.224	.004	.799	.000
Less than \$10,000				.000
\$10,000 to 14,999	-.052	.005	.950	.000
\$15,000 to 19,999	.074	.004	1.077	.000
\$20,000 to 24,999	.109	.004	1.116	.000
\$25,000 to 34,999	.142	.004	1.153	.000
\$35,000 to 49,999	.110	.004	1.116	.000
\$50,000 to 74,999	.063	.004	1.065	.000
\$75,000 or more	-.136	.004	.873	.000
Don't know/Not sure	-.021	.004	.980	.000
Spanish survey requested				.000
English	1.070	.006	2.915	.000
HL Total Score	-.069	.000	.933	.000
Constant	-3.813	.008	.022	.000

	Model 1		Model 2	
Log likelihood		16849355.31	Log likelihood	16790299.6
Cox & Snell R Square		0.0444	Cox & Snell R Square	0.0454
Nagelkerke R Square		0.1557	Nagelkerke R Square	0.1591

variable). A comparison of R^2 analogues for Model 1 (without health literacy) versus Model 2 (including health literacy) for this dependent variable appears at the bottom of table 16. That comparison reveals that total R^2 changed less than 1%. The odds ratio reveals that controlling for all demographic variables, for each unit of increase in health literacy, an individual is about 6% less likely to use smokeless tobacco. (Note the skewed distribution of HL_{TOT} scores renders the exact magnitude of that step-up at each point in the distribution very uncertain.) That is a smaller effect size than for any other factor, especially language preference.

Table 17 conveys the linear regression for averaged number of days of alcohol consumption in

Table 17: Linear Regression for rate of alcoholic beverage consumption in the past 30 days

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-val	R-Square (-HL)	R-Square (+HL)
	B	Std. Error	Beta				
(Constant)	-.010	.000		-32.88	.000	0.071	0.072

GENDER	.073	.000	.141	1097.88	.000
MARITAL STATUS	.005	.000	.017	116.69	.000
RACE/ETHNICITY	-.017	.000	-.095	-572.05	.000
EDUCATION	.028	.000	.111	777.78	.000
EMPLOYMENT	-.007	.000	-.072	-499.16	.000
INCOME	.008	.000	.069	480.47	.000
AGE	.009	.000	.060	383.52	.000
LANGUAGE REQUESTED	.005	.000	.005	29.95	.000
HEALTH LITERACY TOTAL SCORE	.001	.000	.008	59.72	.000

the past 30 days. An examination of R^2 change between Model 1 (without health Literacy) versus Model 2 (including health literacy) for this dependent variable appears in the right-most columns of table 17. That comparison reveals less than 1% R^2 change. The full-scale model—including all 9 predictors—accounts for about 7% of the variance in rate of alcohol consumption. The Beta weight indicates that health literacy accounts for virtually none of the variance in this dependent variable, despite the statistical significance of the regression line. Only language preference is a less potent predictor of rate of alcohol consumption.

Table 18 presents the linear regression for most alcoholic drinks consumed on a single occasion

Table 18: Linear Regression for most drinks on a single occasion past 30 days (#drinks)

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-val	R-Square (-HL)	R-Square (+HL)
	B	Std. Error	Beta				
(Constant)	6.997	.006		1101.13	.000		
GENDER	1.719	.001	.231	1311.08	.000		
MARITAL STATUS	.208	.001	.054	266.46	.000		
RACE/ETHNICITY	-.181	.001	-.064	-305.78	.000		
EDUCATION	-.319	.001	-.082	-421.49	.000	0.128	
EMPLOYMENT	-.040	.000	-.027	-141.76	.000		0.131
INCOME	.009	.000	.005	23.81	.000		
AGE	-.459	.000	-.200	-946.53	.000		
LANGUAGE REQUESTED	-.584	.004	-.033	-155.90	.000		
HEALTH LITERACY TOTAL SCORE	-.104	.000	-.059	-319.73	.000		

in the past 30 days. An examination of R^2 change between Model 1 (without health Literacy) versus Model 2 (including health literacy) for this dependent variable appears in the right-most columns of table 17. That comparison reveals less than 1% R^2 change. The full-scale model—including all 9 predictors—accounts for about 13% of the variance in highest number of drinks consumed in a single day. The Beta weight indicates that health literacy accounts for virtually none of the variance in this dependent variable, despite the statistical significance of the regression line. Only gender and age emerge as potent predictors of the highest number of drinks consumed in one day.

Table 19 presents results for the logistic regression for exercise in the past 30 days (a

Table 19: Logistic regression for +/- exercised in the past 30 days

	Beta	S.E.	OR	p-val
Female				.000
Male	.244	.001	1.277	.000
Ages 65 or older				.000
Ages 18 to 24	-.211	.001	.810	.000
Ages 25 to 34	-.389	.002	.678	.000
Ages 35 to 44	-.499	.002	.607	.000
Ages 45 to 54	-.623	.002	.536	.000
Ages 55 to 64	-.789	.002	.454	.000
Married				.000
Divorced/Widowed/Separated	.064	.001	1.066	.000
Never married	.084	.001	1.087	.000
Member of an unmarried couple	.042	.002	1.043	.000
White				.000
Black	-.123	.001	.884	.000
American Indian or Alaskan Native	.048	.003	1.049	.000
Asian, Pacific Islander, Native Hawaiian	-.175	.002	.840	.000
Hispanic	.037	.002	1.037	.000
Multiracial, and other races	.034	.003	1.034	.000
Did not graduate High School				.000
Graduated High School	.131	.001	1.140	.000
Attended College or Technical School	.419	.001	1.520	.000
Graduated from College or Technical School	.856	.001	2.354	.000
Unable to work				.000
Employed for wages	.754	.001	2.125	.000
Self-employed	.788	.002	2.200	.000
Out of work for 1 year or more	.608	.002	1.836	.000
Out of work for less than a year	.752	.002	2.121	.000
Homemaker	.818	.002	2.266	.000
Student	1.213	.002	3.363	.000
Retired	.702	.001	2.018	.000
Less than \$10,000				.000
\$10,000 to 14,999	-.002	.002	.998	.170
\$15,000 to 19,999	.060	.002	1.062	.000
\$20,000 to 24,999	.156	.002	1.168	.000
\$25,000 to 34,999	.175	.002	1.192	.000
\$35,000 to 49,999	.323	.002	1.382	.000
\$50,000 to 74,999	.485	.002	1.624	.000
\$75,000 or more	.811	.002	2.251	.000
Don't know/Not sure	.072	.002	1.075	.000
Spanish survey requested				.000
English	.385	.002	1.469	.000
HL Total Score	.067	.000	1.070	.000

Constant	-1.012	.003	.364	.000
	Model 1		Model 2	
	Log likelihood	60113574.61	Log likelihood	59886115.69
	Cox & Snell R Square	0.0985	Cox & Snell R Square	0.1020
	Nagelkerke R Square	0.1448	Nagelkerke R Square	0.1500

dichotomous variable). A comparison of R^2 analogues for Model 1 (without health literacy) versus Model 2 (including health literacy) for this dependent variable appears at the bottom of table 19. That comparison reveals that total R^2 changed less than 1%. The odds ratio reveals that controlling for all demographic variables, for each unit of increase in health literacy, an individual is about 7% more likely to exercise. (Note the skewed distribution of HL_{TOT} scores renders the exact magnitude of that step-up at each point in the distribution very uncertain.) That is a smaller effect size than for any other factor.

Table 20 presents results for the logistic regression for flu vaccination in last 12 months (a

Table 20: Logistic regression for +/- received flu shot in past 12 months

	Beta	S.E.	OR	p-val
Female				.000
Male	-.270	.001	.763	.000
Ages 65 or older				.000
Ages 18 to 24	-.030	.001	.970	.000
Ages 25 to 34	-.033	.001	.968	.000
Ages 35 to 44	.159	.001	1.173	.000
Ages 45 to 54	.531	.001	1.700	.000
Ages 55 to 64	1.152	.002	3.165	.000
Married				.000
Divorced/Widowed/Separated	-.067	.001	.935	.000
Never married	-.208	.001	.812	.000
Member of an unmarried couple	-.035	.002	.966	.000
White				.000
Black	-.184	.001	.832	.000
American Indian or Alaskan Native	-.031	.003	.969	.000
Asian, Pacific Islander, Native Hawaiian	.223	.002	1.250	.000
Hispanic	-.135	.001	.874	.000
Multiracial, and other races	-.086	.002	.918	.000
Did not graduate High School				.000
Graduated High School	-.186	.001	.830	.000
Attended College or Technical School	-.062	.001	.940	.000
Graduated from College or Technical School	.272	.001	1.312	.000
Unable to work				.000
Employed for wages	-.381	.001	.683	.000
Self-employed	-.963	.002	.382	.000
Out of work for 1 year or more	-.559	.002	.572	.000
Out of work for less than a year	-.509	.002	.601	.000

Homemaker	-.698	.002	.497	.000
Student	-.055	.002	.947	.000
Retired	-.200	.001	.819	.000
Less than \$10,000				.000
\$10,000 to 14,999	.173	.002	1.189	.000
\$15,000 to 19,999	.249	.002	1.283	.000
\$20,000 to 24,999	.166	.002	1.181	.000
\$25,000 to 34,999	.182	.002	1.199	.000
\$35,000 to 49,999	.264	.002	1.302	.000
\$50,000 to 74,999	.293	.002	1.341	.000
\$75,000 or more	.464	.002	1.591	.000
Don't know/Not sure	.270	.002	1.310	.000
Spanish survey requested				.000
English	-.011	.002	.989	.000
HL Total Score	.075	.000	1.078	.000
Constant	-1.238	.003	.290	.000

	Model 1		Model 2
Log likelihood	72169845.37	Log likelihood	71876531.48
Cox & Snell R Square	0.0907	Cox & Snell R Square	0.0953
Nagelkerke R Square	0.1228	Nagelkerke R Square	0.1290

dichotomous variable). A comparison of R^2 analogues for Model 1 (without health literacy) versus Model 2 (including health literacy) for this dependent variable appears at the bottom of table 20. That comparison reveals that total R^2 changed less than 1%. The odds ratio reveals that controlling for all demographic variables, for each unit of increase in health literacy, an individual is almost 8% more likely to have received a flu vaccination. (Note the skewed distribution of HL_{TOT} scores renders the exact magnitude of that step-up at each point in the distribution very uncertain.) That is a smaller effect size than for any other factor.

Table 21 presents the logistic regression for seat belt use. In order to analyze this BRFSS question using a regression analysis, it was necessary to dichotomize the four response options. “Always” and “usually” responses were coded as “1.” “Seldom” and “never” were coded as zero.

Table 21. Logistic regression for dichotomized seatbelt use

	Beta	S.E.	OR	p-val
Female				.000
Male	-.686	.001	.503	.000
Ages 65 or older				.000
Ages 18 to 24	.054	.002	1.056	.000
Ages 25 to 34	.335	.002	1.399	.000
Ages 35 to 44	.531	.002	1.700	.000
Ages 45 to 54	.526	.003	1.692	.000
Ages 55 to 64	.660	.003	1.935	.000
Married				.000
Divorced/Widowed/Separated	-.252	.002	.777	.000

Never married	-.180	.002	.836	.000
Member of an unmarried couple	-.300	.003	.741	.000
White				.000
Black	.065	.002	1.067	.000
American Indian or Alaskan Native	-.308	.004	.735	.000
Asian, Pacific Islander, Native Hawaiian	.819	.005	2.267	.000
Hispanic	.126	.003	1.134	.000
Multiracial, and other races	.141	.004	1.152	.000
Did not graduate High School				.000
Graduated High School	.066	.002	1.068	.000
Attended College or Technical School	.405	.002	1.499	.000
Graduated from College or Technical School	.932	.002	2.540	.000
Unable to work				.000
Employed for wages	-.004	.002	.996	.102
Self-employed	-.498	.003	.608	.000
Out of work for 1 year or more	-.042	.004	.959	.000
Out of work for less than a year	.054	.004	1.055	.000
A homemaker	.185	.004	1.203	.000
A student	.350	.003	1.419	.000
Retired	.168	.003	1.183	.000
Less than \$10,000				.000
\$10,000 to 14,999	-.190	.003	.827	.000
\$15,000 to 19,999	.006	.003	1.006	.060
\$20,000 to 24,999	.114	.003	1.121	.000
\$25,000 to 34,999	-.010	.003	.990	.001
\$35,000 to 49,999	-.007	.003	.993	.022
\$50,000 to 74,999	.133	.003	1.142	.000
\$75,000 or more	.247	.003	1.280	.000
Don't know/Not sure	.097	.003	1.101	.000
Spanish survey requested				.000
English	-1.170	.004	.310	.000
HL Total Score	.099	.000	1.104	.000
Constant	2.593	.006	13.364	.000

	Model 1	Model 2
Log likelihood	24661202.13	24479775.74
Cox & Snell R Square	0.0283	0.0314
Nagelkerke R Square	0.0776	0.0859

A comparison of R^2 analogues for Model 1 (without health literacy) versus Model 2 (including health literacy) for this dependent variable appears at the bottom of table 21. That comparison reveals that total R^2 changed less than 1%. The odds ratio reveals that controlling for all demographic variables, for each unit of increase in health literacy, an individual is about 10% more likely to use seat belts. (Note the skewed distribution of HL_{TOT} scores renders the exact magnitude of that step-up at each point in the distribution very uncertain.) That is a smaller effect size than for respondent sex or language preference.

Table 22 summarizes the regression for the index of chronic disease burden. As described in the methods section above, this index was constructed by counting the number of chronic diseases

Table 22: Linear Regression for chronic disease burden index

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-val	R-Square (-HL)	R-Square (+HL)
	B	Std. Error	Beta				
(Constant)	.404	.001		289.72	.000		
GENDER	-.119	.000	-.044	-379.65	.000		
MARITAL STATUS	.025	.000	.017	132.77	.000		
RACE	-.031	.000	-.033	-222.27	.000		
EDUCATION	-.073	.000	-.054	-421.90	.000	0.246	
EMPLOYMENT	.124	.000	.251	1934.64	.000		0.247
INCOME	-.060	.000	-.103	-796.73	.000		
AGE	.223	.000	.278	1992.63	.000		
LANGUAGE REQUESTED	.325	.001	.064	429.42	.000		
HEALTH LITERACY TOTAL SCORE	-.025	.000	-.042	-343.76	.000		

for which each respondent reports receiving a diagnosis. The value of this index can range from 0-11. An examination of R^2 change between Model 1 (without health Literacy) versus Model 2 (including health literacy) for this dependent variable appears in the right-most columns of table 17. That comparison reveals very little R^2 change. The full-scale model—including all 9 predictors—accounts for about 25% of the variance in the number of chronic diseases diagnosed. The Beta weight indicates that health literacy accounts for virtually no unique variance in this dependent variable, despite the statistical significance of the regression line. Only employment and age emerge as potent predictors of chronic disease.

Discussion and Recommendations

This report analyzed data generated by a first attempt to scale up population surveillance of health literacy in the context of large scale public health data collection. The data derived from a 3-question optional module of the BRFSS (BRFSS/HL). In 2016, 17 states administered the health literacy module to a sample of 63,028,536 adults (after weighting).

The project succeeded in answering the five research questions posed.

1. Does any evidence point to lack of acceptability to respondents or other problems in administering the BRFSS/HL? *No. The instrument appeared to pose no impediments to response.*
2. What is the overall distribution of BRFSS/HL scores? *A composite HL_{TOT} score was highly skewed in a positive direction (left skewed). About 43% of respondents gave the highest possible response to all three BRFSS/HL questions. This distribution rendered the module unacceptable as an index of health literacy prevalence. When dichotomized in a median split, however, the scores were useful in bivariate analyses.*
3. How are BRFSS/HL scores associated with selected demographic factors? *Bivariate analyses found health literacy associated with all of the demographic variables examined, not always in predictable ways.*
4. How are BRFSS/HL scores associated with selected health status and health behavior variables? *Bivariate analyses found health literacy meaningfully associated with most of the health status and health behavior variables examined. Some of these variables have received scant attention in the extant health literacy literature.*
5. What do BRFSS/HL scores contribute to the predictive value of selected demographic factors (social determinants) in explaining variance in selected health status and health behavior variables? *Health literacy scores explained virtually no variance that was not already explained by demographic variables. In general, HL_{TOT} was not a strong predictor once variance from other social determinants of health was partialled out.*

The overall conclusion, taking this constellation of findings together, must be that the current version of the BRFSS/HL module is inadequate to the task of determining the distribution of health literacy proficiency in the U.S. population. Nonetheless, even this sub-optimal instrument reveals that levels of health literacy differ--sometimes dramatically--across social and socioeconomic groups in our nation. It also reveals that individuals with the highest level of self-reported health literacy differ from their counterparts with lower health literacy in terms of certain indices of health and certain health protective behaviors.

No evidence of aberrant item nonresponse patterns emerged for the BRFSS/HL module. Internal consistency for the three items was .733 (Cronbach's alpha), thus justifying summing the items into a single HL_{TOT} score. However, the distribution of HL_{TOT} scores displayed a problematic positive skewedness. About 43% of the respondents chose the highest possible responses on all three questions. That is, they responded "very easy" to all of the following questions:

1. How difficult is it for you to get advice or information about health or medical topics if you needed it?
2. How difficult is it for you to understand information that doctors, nurses and other health professionals tell you?

3. In general, how difficult is it for you to understand written health information?

By all accounts, however, it is *not* “very easy” for the majority of Americans to obtain or understand health information. One assessment of older adults’ comprehension of hospital discharge instructions, for example, found that only about half of discharged patients comprehended instructions for diet and for exercise (Albrecht, Gruber-Baldini, Hishon, et al., 2014). Many patients with histories of treatment for a chronic disease have poor ability to obtain reliable information on the Internet about their conditions (Kalichman, Cherry, Cain, et al., 2006). Clearly, then, BRFSS/HL is not suitable for estimating prevalence of health literacy. It fails as a successor to the widely cited prevalence estimates of the 2003 NAAL instrument.

One can only speculate why so many respondents offered such an obvious over-estimate of their health literacy prowess. Perhaps “very easy” was the socially desirable response in the context of a live telephonic interview that had already traversed so much territory about personal health by the time it got to asking about health literacy. That is, respondents might have been embarrassed at that point to admit that they really don’t understand health information very well. It is well established that low health literacy engenders much shame, and one consequence of that shame is patient dissimulation (Parikh, Parker, Nurss, et al., 1996). As a follow-up, it would be interesting to see if this positive (left) skew was equally pronounced were the BRFSS/HL administered in writing, and at the front end of a health survey rather than toward the end.

It is worth noting that although the BRFSS/HL yielded an overestimate of population health literacy, at its lower tail the estimate is not out of line with other findings using similar instruments in large scale surveys. If low health literacy were defined for the BRFSS/HL by marking an average of “difficult” or “very difficult” for all three items ($HL_{TOT} < 7$), then 8.4% of the sample qualifies as low health literacy. This figure compares with 5% “inadequate” health literacy among VHA patients (Haun, et al., 2015) and 8.6% “low” health literacy in the 2012 BRFSS administration in Kansas (Chesser, 2016). Like the BRFSS/HL, both of those studies utilized some variant of the three brief health literacy screening items.

The skewness of the distribution reduced its utility in statistical analyses. The highest possible score on HL_{TOT} was also the distribution’s mode. Falling above the median in a median split meant scoring the highest possible score. In contrast, one would wish for a more dispersed distribution for this variable--a normal, or even uniform distribution--so that it could discriminate more effectively among respondents. Nor was this distribution amenable to any nonlinear transformation that might have improved its ability to discriminate. Although regressions are robust to violations of assumptions like normal distribution of residuals, no doubt a more dispersed set of HL_{TOT} scores would have rendered it a more potent predictor in regression analyses.

Notwithstanding its less than optimal distribution, HL_{TOT} proved to be a meaningful variable in the bivariate, median split analyses in which respondents above the median in health literacy were compared with those below the median. A number of alternative ways of dichotomizing HL_{TOT} were tested before settling on a simple median split as most suitable. In addition, a rank order analysis among states revealed that the median split rankings were consistent with rankings of average HL_{TOT} scores.

The empirical associations between health literacy and demographic factors in the present study mirror those reported elsewhere (e.g., Berkman, et al., 2011; Paasche-Orlow, Gazmararian, Parker, et al., 2005). For example, women were disproportionately represented among those with higher health literacy, and individuals

who preferred Spanish language survey administration were over-represented below the median. There was a direct, monotonic relation between health literacy and income. On the other hand, the relation between age and health literacy is not monotonic. Both those over the age of 65 and those below the age of 25 were at risk for lower health literacy.

Findings regarding race/ethnicity in the present study do not entirely echo previous studies. Whereas Asians, Pacific Islanders, Native Hawaiians and Hispanics were among those at particular risk of lower health literacy, relative to white respondents, Black respondents were not (OR=1.01). This finding runs contrary to a plethora of other studies which found lower health literacy among African Americans relative to white Americans (see Sheridan et al., 2011). This contrary finding invites deeper analysis. For example, it might be informative to examine race/ethnicity in interaction with other socioeconomic factors like education and employment. It may be that findings in the current research literature regarding the prevalence of low health literacy among African Americans are an artifact of low SES or of clinic-based samples only.

Other demographic findings may not have been directly studied at all prior to this research. For example, marital status has been little studied with respect to health literacy, but the BRFSS does make it available for investigation. In the present research, being a married adult seems to confer a protective benefit for health literacy. This finding is consistent with conceptualizations that highlight the role of social interaction in undergirding health literacy. Having a partner in one's household with whom to discuss health issues or to accompany a patient to a medical appointment probably does confer health literacy benefits. Social isolation is indeed inversely correlated with health literacy (Lee, Gazmararian & Arazullah, 2006).

Employment status is another variable available on the BRFSS that has been little studied in conjunction with health literacy. The analysis presented here uses the category "unable to work" as the reference for calculating odds ratios. Those unable to work are more likely to fall below the median in health literacy, relative to all others, including even the unemployed. What might be the explanation? If there is meaningful overlap between "unable to work" and physical and mental disability, then a possible explanation emerges (National Academies of Sciences, Engineering, and Medicine, 2017). For example, low health literacy is associated with visually impaired individuals who may experience particular difficulty obtaining health information through reading or via the Internet (Echt & Burrige, 2011).

Just as the BRFSS/HL sheds valuable light on relations between health literacy and demographic factors, so too did it yield insight into the association between health literacy and respondents' health status and prevention behaviors. BRFSS offers data regarding a myriad of health outcomes and behaviors. This project selected just 15 of those, including a constructed index of chronic disease burden.

As in previous research (see Berkman et al., 2011), health literacy was associated with health status. For example, on average individuals with lower health literacy experienced about 50% more days of poor mental or physical health each month (M=5.55), compared with persons with higher health literacy (M=3.68). Similarly, people below the median in health literacy reported about 20% more chronic disease conditions (M=1.17) than those with highest health literacy (M=.95).

Likewise, results arising from the BRFSS/HL confirmed previous research indicating that health literacy is associated with preventive behaviors (Scott, Gazmararian & Williams, 2002). For example, those who

exercised regularly and those who obtained flu vaccination were respectively 60% and 40% more likely to be among those with highest health literacy, rather than falling below the median in health literacy.

Because of the scope of prevention variables included on the BRFSS, the present study revealed some patterns in health behaviors that are not frequently examined in conjunction with health literacy. One example is use of seat belts. Those who reported always using a seat belt were about 80% more likely to be in the highest health literacy group, relative to those who never used seat belts. Those who used tobacco products were about 30% less likely to have highest health literacy. This analysis also confirmed a limited body of research that associates health literacy with obtaining health insurance coverage (Chumbler & Rubin, 2014).

Those who reported using multiple health care providers were 60% more likely to be among the highest health literacy group rather than in the lower group. It is difficult to interpret this finding. On the one hand, high health literacy has been associated with more prudent or moderate use of health services such as avoiding emergency department visits or infrequent rehospitalizations due to poor self-care (see Berkman et al, 2011; but not in all research—see Cho, Lee & Arozullah, 2006). On the other hand, individuals with high health literacy might be expected to seek specialist referrals and second opinions.

A curious finding emerged from questions about alcohol use. Individuals from the highest health literacy group consumed alcohol on more occasions (days) per month than did individuals falling below the median in health literacy. On the other hand, individuals falling below the median in health literacy consumed a larger number of alcoholic beverages at a single sitting. This pair of findings suggests that health literacy is associated more with responsible drinking rather than with abstinence. Previous literature has rarely addressed how health literacy affects patterns of alcohol consumption.

While the bivariate analyses involving the BRFSS/HL were illuminating, the series of regressions were less so. The value of pursuing multiple regression is that it permits an examination of health literacy while partialling out the shared variance with the other demographic variables. That is, it isolates the unique contribution of health literacy to each of the outcomes of interest, independently of other social determinants of health. This project evaluated two regression models for each of the 15 selected health status or health behavior dependent variables. The first model included eight demographic predictors, but not HL_{TOT} . The second model included those eight predictors along with HL_{TOT} . For none of the 15 dependent variables did adding health literacy into the second model appreciably increase the amount of variance explained. Moreover, most of the Beta-weights (for linear regressions of continuous variables like days of poor physical health) and odds ratios (for dichotomous variables like smoked cigarettes in last 30 days) indicated small effect sizes for health literacy. The largest effect sizes for health literacy were indicated by the odds ratios for regressions of general health and seat belt use (both dichotomized). Odds ratios indicated that holding all other variables constant, for each unit increase in HL_{TOT} scores, respondents were about 10% more likely to experience good health and about 10% more likely to use seat belts. However, caveats must be invoked in interpreting even these two results, since the distribution of HL_{TOT} was so skewed, the effect of unit changes in HL_{TOT} scores would vary from one data point to another on that instrument.

There are several mathematical explanations for the poor performance of HL_{TOT} as a predictor of health status and health behaviors in the regression analyses. First, the skewedness of the HL_{TOT} distribution, especially the high frequency of modal responses at the highest possible data point, limited the variance of this predictor

variable. Second, the total variance explained (R^2) for each of the 15 regressions was never sizeable. The highest R^2 of the 15 regressions was about .25 for the full rank model predicting chronic disease burden. Limited variance available to partition necessarily limits the impact of any given predictor. Finally, the bivariate analyses suggested that there was a fair degree of collinearity between HL_{TOT} and several of the demographic variables. High collinearity likewise limits the amount of unique variance any predictor variable can display.

Recommendations

1. While the current version of HL_{TOT} did not prove sufficiently discriminating to ascertain health literacy prevalence, the refinement of a health literacy index that can be efficiently administered within a large-scale population-based survey remains of key importance for public health policy and practice.
2. Self-report scales have obvious advantages for administration as a BRFSS module, but because of the shame factor may inevitably result in respondents over-estimating their health literacy capacity. The most well-accepted population-based measure of health literacy—the NAAL health literacy scale—was a direct performance measure. Direct performance-based alternatives to self-report, such as a brief health listening measure, should be piloted for BRFSS administration.
3. If a self-report scale is to be retained in a BRFSS health literacy module, a systematic program exploring the effects of small adjustments in wording should be undertaken. For example, reverting back to the “how often” question stems of the original brief health literacy screener (Chew et al., 2003) might mitigate the extreme positive (left) skewedness found in the current BRFSS/HL.
4. The present project could only explore a select number of demographic variables and health status and health behavior variables among the myriad included in the BRFSS. Subsequent researchers should investigate associations between health literacy and additional variables of interest using the 2016 data set.
5. Future studies should consider stratifying analyses by potent demographic or health status variables. For example, does the association between health literacy and use of multiple health care providers differ among those who experience many days of poor health as opposed to those who experience few days of poor health? Does health literacy affect self-reported overall health differently depending on the respondent’s age? Are highly educated persons with multiple chronic disease diagnoses of higher health literacy than less educated persons with a similar chronic disease history?
6. Geography is in many ways a determinant of health. Region is also a common basis for public health interventions. In most states, BRFSS data can be reliably disaggregated to region or health district. That geographical information is not available on the public-facing dataset used in this project. However, a questionnaire sent to state BRFSS coordinators asked them to disaggregate scores on the three health literacy module items by region. Although formal analysis was not possible, informal inspection suggested significant geographic disparities in health literacy. Analyses of geographic disparities in health literacy should be pursued at the state level.
7. Certain new or unexpected findings reported in this project deserve further analysis.
 - a. Racial/ethnic disparities found here were more nuanced than in some previous research. Specifically, Black Americans showed no significant disparity in health literacy relative to white Americans. This finding invites further exploration utilizing race x income or race x education interaction terms.

- b. Being currently married was protective of health literacy in the present study. That finding invites more careful study of the role of social interaction and co-navigating health care in mediating individual health literacy.
 - c. Individuals whose employment status was “unable to work” were likely to fall below the median in health literacy. This finding invites further research on health literacy among disabled persons, a topic which is only now beginning to be explored.
 - d. Why was health literacy associated with using multiple health care providers? Could it be that health literacy does not determine the amount of health services consumed, but rather the sophistication of health services consumed? This finding might prompt further research into the role of health literacy in obtaining specialist referrals and second opinions, as opposed to consuming expensive services like frequent ED visits with little payoff in terms of quality of care or outcomes.
8. Most importantly, the results of this project need to be deployed in crafting better public health promotion that is better targeted to those at risk. That is, these results can inform health literacy interventions. Some examples warranted by the findings of BRFSS/HL include the following:
- a. Receiving a flu vaccination was associated with health literacy. This finding suggests that flu vaccination messages need to incorporate health literacy best practices such as making numeric probabilities comprehensible and need to be directed to low literate adults. Similar practices should be adopted for tobacco control and for responsible consumption of alcohol.
 - b. Using seat belts was rather strongly associated with health literacy. Driving safety campaigns might be recast as health promotion campaigns and make use of some techniques that have proven useful in community-based health literacy interventions. These techniques include use of community health workers, periodic SMS messaging, and graphic-rich health promotion materials such as photo novellas.
 - c. The fact that being married was associated with health literacy suggests that public health in the US can make better use of the dyad in health promotion and education, much as many successful HIV testing programs have adopted a voluntary couples testing (VCT) model.
 - d. Young adults, like older adults, tended to score below the median in health literacy. While many health literacy programs have been developed for older adults, sometimes the health literacy deficits of young adult populations are ignored, since they use relatively fewer health services. But results of this study demonstrate the urgent need for health literacy training for adolescents and young adults as well.

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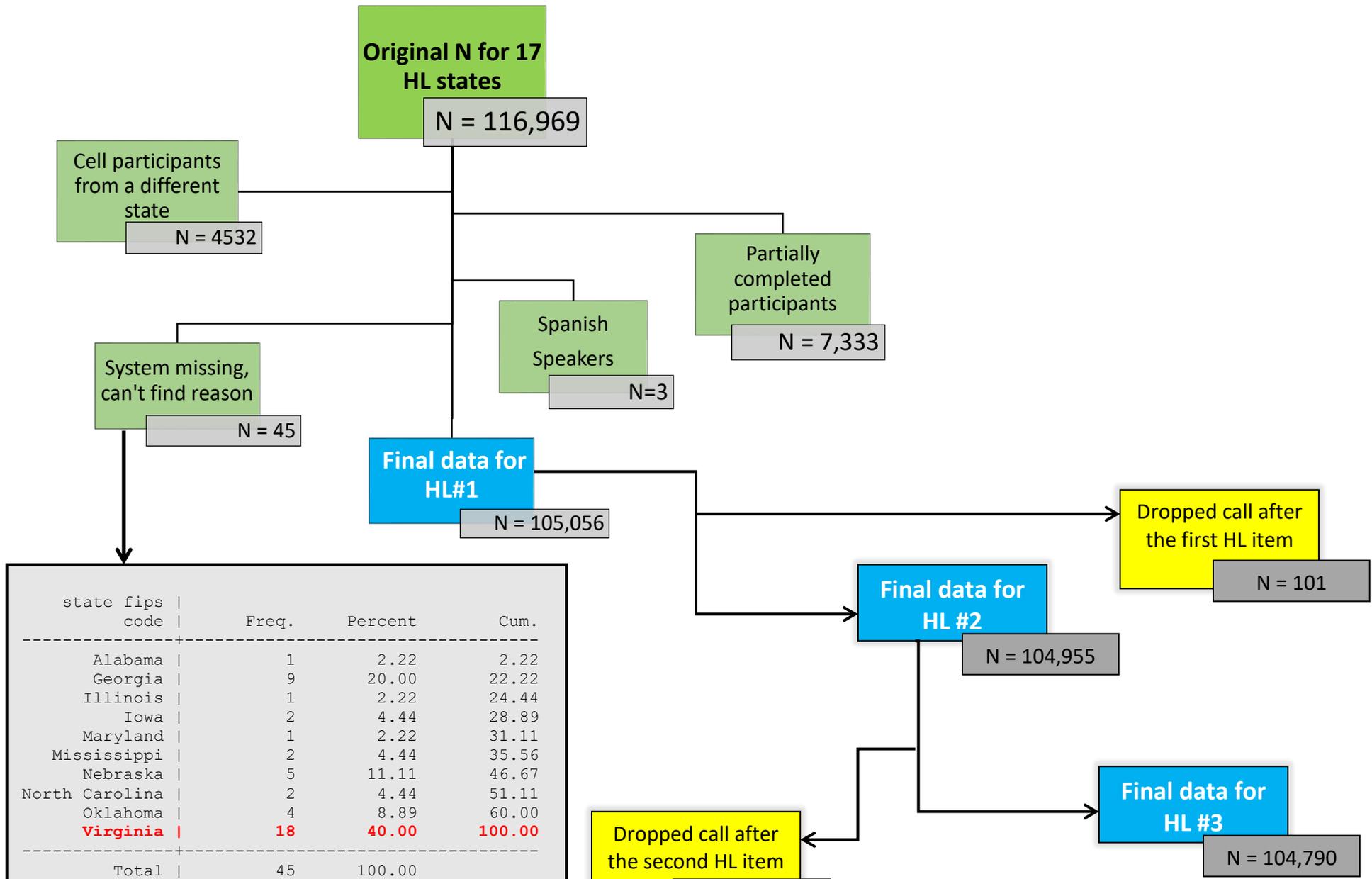
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Appendix A:
Flow Diagram Showing Sources of Invalid Cases



Appendix B:

Questionnaire Sent to 17 BRFSS Coordinators from States and Territories Administering the 2016 BRFSS/HL Module

Report of 2016 BRFSS Administration—Health Literacy Optional Module

Please email your completed questionnaire to Don Rubin [drubin@uga.edu; 404-660-0911]. Please send it no later than January 10, 2018.

1) State or Territory: _____

2) Contact information

a. Contact Name: _____

b. Phone number: _____

c. Email address: _____

3) Raw and Weighted Frequencies of Health Literacy Responses **2016 BRFSS**. NOTE: If possible please exclude out-of-state residents, since they would not have been administered any of the optional modules.

Item responses	HL1: get advice or info about health (Var: medadvic)				HL2: understand info that that doctors..tell you (Var: undrstnd)				HL3: understand written health info (Var: written)			
	unweighted data		weighted data		unweighted data		weighted data		unweighted data		weighted data	
	N	%	N	%	N	%	N	%	N	%	N	%
1 – very easy												
2 – somewhat easy												
3 – somewhat difficult												
4 – very difficult												

5 – I don't pay attention/don't look for health info					NON APPLICABLE							
7 – don't know/not sure												
9 - refused												
BLANK – not asked or missing												

4) Raw and Weighted Frequencies for Selected Demographics **2016 BRFSS**. NOTE: If possible please exclude out-of-state residents, since they would not have been administered any of the optional modules.

Selected variables	Item responses	unweighted		N	weighted	
		N	%		%	
Final Disposition	1100 - completed					
	1200 – partial complete					
Language Identifier	1 - English					
	2 - Spanish					
	3 – 99 - other					
	BLANK - missing					
Sex	1 - male					
	2 - female					
	9 - refused					
	BLANK – not asked or missing					
Education	1 – never attended or just K					
	2- Grade 1-8					
	3 – Grade 9-11					
	4 – Grade 12 or GED					
	5 – College 1-3 yrs					
	6 – College 4+					
	9 - Refused					

	BLANK - not asked or missing				
Computed Race-Ethnicity Grouping [SAS variable name _RACE]	1 – white non-Hispanic				
	2 – black non-Hispanic				
	3 - AI/AN non-Hispanic				
	4 – Asian non-Hispanic				
	5 – NH/PI non-Hispanic				
	6 – other non-Hispanic				
	7 – multi non-Hispanic				
	8 - Hispanic				
	9 – don't know/not sure/refused				
	BLANK – not asked or missing				

5) Frequencies of Health Literacy Scores by Geographic Location **2016 weighted scores only**

(a) HL1: How difficult is it for you to get advice or information about health or medical topics if you need it? Please provide sample size and percentage N(%).

	1 – very easy	2 – somewhat easy	3 – somewhat difficult	4 – very difficult	5 – I don't pay attention/don't look for health info	7 – don't know/not sure	9 - refused	BLANK – not asked/missing
Region1*								
Region2								
Region3								
Region4								
.								
[add regions as needed].								
.								

*Please list all the geographic regions to which your state or territory can disaggregate data.

(b) HL2: How difficult is it for you to understand information that doctors, nurses and other health professionals tell you? Please provide sample size and percentage N(%).

	1 – very easy	2 – somewhat easy	3 – somewhat difficult	4 – very difficult	7 – don't know/not sure	9 - refused	BLANK – not asked/ missing
Region1*							
Region2							
Region3							
Region4							
.							
[add regions]							
.							

*Please list all the geographic regions to which your state or territory can disaggregate data.

(c) HL3: How difficult is it for you to understand written health information? Please provide sample size and percentage N(%).

	1 – very easy	2 – somewhat easy	3 – somewhat difficult	4 – very difficult	5 – I don't pay attention/don't look for health info	7 – don't know/not sure	9 - refused	BLANK – not asked/ missing
Region1*								
Region2								
Region3								
Region4								
.								
[add regions]								
.								

*Please list all the geographic regions to which your state or territory can disaggregate data.

(d) In your state or territory, do you have a way of dichotomizing between urban and rural regions?

6) Analysis of Item Nonresponse Pre and Post HL module

(a) What item was administered immediately preceding the health literacy module?

a. Unweighted frequency BLANK on this preceding item:

(b) Unweighted frequency BLANK on HL1: How difficult is it for you to get advice...?

(c) What item was administered immediately following the health literacy module?

a. Unweighted frequency BLANK on this following item:

(d) Is there evidence of different patterns of nonresponse for the health literacy module as compared with other BRFSS items? If so, why might that be so?

7) What is the number of calls in your state/territory terminated due to “language barrier?” _____

What is the percent of calls in your state/territory terminated due to “language barrier?” _____

8) In your state or territory, how do you determine the best denominator to use in reporting relative frequencies for BRFSS state or optional module items? That is, for non-core questions, what respondents do you typically *exclude* in figuring percentages for each response category?

9) In your informed opinion, how might your state/territory public health agency use health literacy findings from the BRFSS?

10) In your informed opinion, what factors will determine when your state will next administer the health literacy optional module?

Appendix C

Regression Analyses Using Individual Health Literacy Items in Lieu of HL_{TOT} to Predict Number of Days of Poor Physical and Mental Health

Table C.1: Linear multiple regression of number of days of poor physical and mental health (last 30 days) using health literacy item #1 in lieu of HL_{TOT} as a predictor

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.125	0.013		329.288	0.000
	GENDER	0.494	0.003	0.027	159.971	0.000
	MARITAL STATUS RECODED	-0.288	0.002	-0.031	-156.664	0.000
	RACE CATEGORY6	0.007	0.001	0.001	4.807	0.000
	EDUCATIONAL CATEGORY MINUS REFUSAL	-0.517	0.002	-0.058	-313.325	0.000
	EMPLOYMENT STATUS REMOVED REFUSAL/ DON'T KNOWS	0.900	0.001	0.285	1464.897	0.000
	INCOME LEVEL RECODED	-0.429	0.001	-0.115	-604.800	0.000
	IMPUTED AGE IN SIX GROUPS	0.153	0.001	0.029	139.570	0.000
	Language spoken	1.165	0.008	0.032	149.758	0.000
	2	(Constant)	1.876	0.013		141.704
GENDER		0.415	0.003	0.023	134.785	0.000
MARITAL STATUS RECODED		-0.297	0.002	-0.032	-162.236	0.000
RACE CATEGORY6		-0.016	0.001	-0.003	-11.786	0.000
EDUCATIONAL CATEGORY MINUS REFUSAL		-0.351	0.002	-0.039	-209.360	0.000
EMPLOYMENT STATUS REMOVED REFUSAL/ DON'T KNOWS		0.890	0.001	0.281	1453.884	0.000
INCOME LEVEL RECODED		-0.409	0.001	-0.110	-578.697	0.000

IMPUTED AGE IN SIX GROUPS	0.151	0.001	0.029	138.338	0.000
Language spoken	1.264	0.008	0.035	163.131	0.000
undrstnd2	1.117	0.002	0.089	506.632	0.000

Table C.2: Linear multiple regression of number of days of poor physical and mental health (last 30 days) using health literacy item #2 in lieu of HL_{TOT} as a predictor

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	4.191	0.013		334.775	0.000
GENDER	0.479	0.003	0.027	155.569	0.000
MARITAL STATUS RECODED	-0.294	0.002	-0.031	-160.168	0.000
RACE CATEGORY6	0.012	0.001	0.002	8.530	0.000
EDUCATIONAL CATEGORY MINUS REFUSAL	-0.511	0.002	-0.057	-309.938	0.000
EMPLOYEMENT STATUS REMOVED REFUSAL/I DON'T KNOWS	0.899	0.001	0.284	1465.083	0.000
INCOME LEVEL RECODED	-0.425	0.001	-0.114	-600.034	0.000
IMPUTED AGE IN SIX GROUPS	0.151	0.001	0.029	137.636	0.000
Language spoken	1.077	0.008	0.030	138.496	0.000
2 (Constant)	3.066	0.013		236.755	0.000
GENDER	0.417	0.003	0.023	135.372	0.000
MARITAL STATUS RECODED	-0.315	0.002	-0.034	-171.993	0.000
RACE CATEGORY6	0.004	0.001	0.001	2.944	0.003
EDUCATIONAL CATEGORY MINUS REFUSAL	-0.422	0.002	-0.047	-252.595	0.000
EMPLOYEMENT STATUS REMOVED REFUSAL/I DON'T KNOWS	0.896	0.001	0.283	1462.923	0.000
INCOME LEVEL RECODED	-0.408	0.001	-0.110	-575.007	0.000

IMPUTED AGE IN SIX GROUPS	0.152	0.001	0.029	138.885	0.000
Language spoken	1.181	0.008	0.033	151.916	0.000
medadvic2	0.486	0.001	0.058	330.790	0.000

Table C.3: Linear multiple regression of number of days of poor physical and mental health (last 30 days) using health literacy item #3 in lieu of HL_{TOT} as a predictor

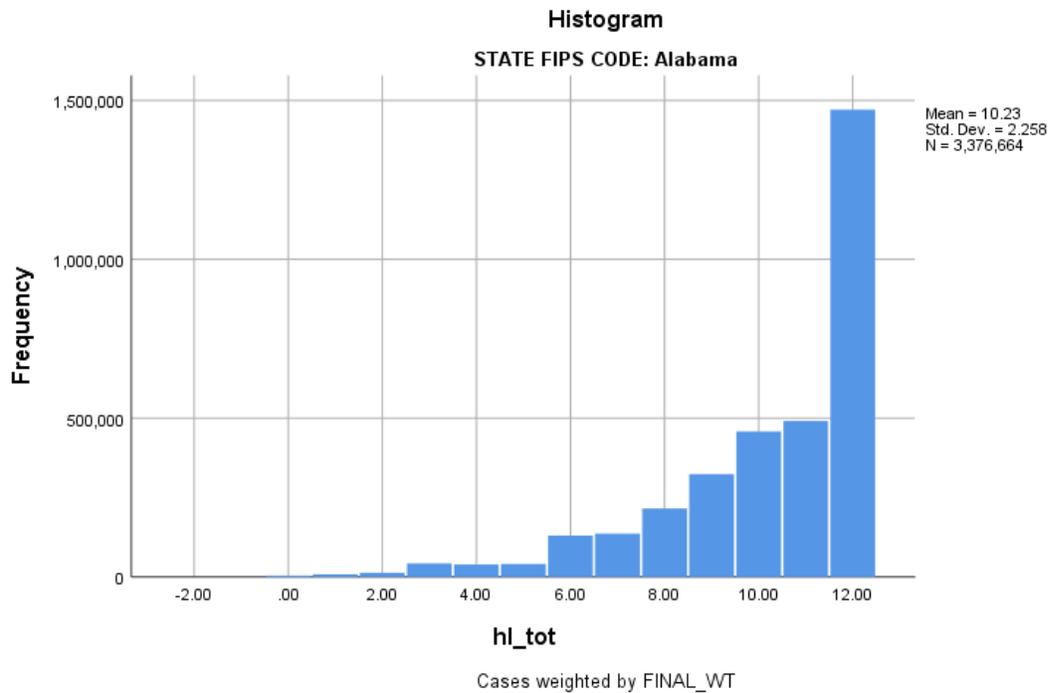
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.126	0.013		329.304	0.000
	GENDER	0.524	0.003	0.029	169.800	0.000
	MARITAL STATUS RECODED	-0.294	0.002	-0.031	-160.108	0.000
	RACE CATEGORY6	0.012	0.001	0.002	8.937	0.000
	EDUCATIONAL CATEGORY MINUS REFUSAL	-0.509	0.002	-0.057	-308.443	0.000
	EMPLOYEMENT STATUS REMOVED REFUSAL/I DON'T KNOWS	0.905	0.001	0.286	1472.321	0.000
	INCOME LEVEL RECODED	-0.428	0.001	-0.115	-603.690	0.000
	IMPUTED AGE IN SIX GROUPS	0.153	0.001	0.029	139.592	0.000
	Language spoken	1.113	0.008	0.031	143.120	0.000
	2	(Constant)	3.120	0.013		241.047
GENDER		0.450	0.003	0.025	145.422	0.000
MARITAL STATUS RECODED		-0.306	0.002	-0.033	-166.916	0.000
RACE CATEGORY6		0.003	0.001	0.000	1.912	0.056
EDUCATIONAL CATEGORY MINUS REFUSAL		-0.400	0.002	-0.045	-236.831	0.000
EMPLOYEMENT STATUS REMOVED REFUSAL/I DON'T KNOWS		0.896	0.001	0.283	1458.522	0.000
INCOME LEVEL RECODED		-0.421	0.001	-0.113	-594.234	0.000

IMPUTED AGE IN SIX GROUPS	0.146	0.001	0.028	133.244	0.000
Language spoken	1.167	0.008	0.032	150.278	0.000
written2	0.425	0.001	0.054	302.664	0.000

Appendix D

HLtot Descriptive Statistics and Demographic Distribution for Each of 17 States/Territories Separately

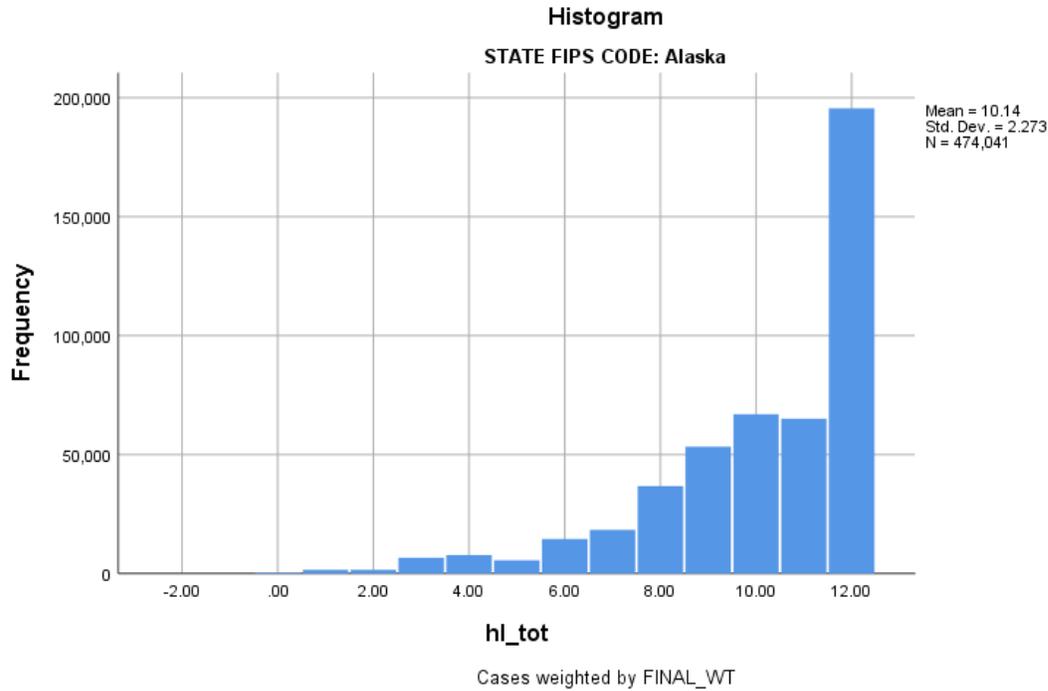
D.1 Alabama HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	<i>p</i> - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	636702	39.9%	958360	60.1%	1.33	
Female	834107	46.82%	947494	53.2%	REF	0.000
Age [Var:Sex]						
Ages 18 to 24	179432	44.8%	221507	55.2%	0.79	
Ages 25 to 34	247842	46.6%	284067	53.4%	0.74	0.000
Ages 35 to 44	265979	49.8%	267868	50.2%	0.65	
Ages 45 to 54	254455	43.9%	325711	56.1%	0.82	
Ages 55 to 64	232329	39.6%	354566	60.4%	0.98	
Ages 65 or older	290772	39.1%	452135	60.9%	REF	
Race [var:RACE]						
White	984300	42.7%	1319309	57.3%	REF	
Black	391645	47.0%	441510	53.0%	0.84	0.000
American Indian or Alaskan Native	15544	31.0%	34572	69.0%	1.66	

Asian, Pacific Islander, Native Hawaiian	4686	33.6%	9241	66.4%	1.47	
Hispanic	34158	36.4%	59778	63.6%	1.31	
Multiracial, and other races	22843	50.3%	22570	49.7%	0.74	
Marital Status [Var:MARITAL]						
Married	806656	46.7%	918894	53.3%	REF	
Divorced/Widowed/Separated	300877	37.6%	498964	62.4%	1.46	0.000
Never married	308675	42.2%	422363	57.8%	1.20	
A member of an unmarried couple	48473	45.5%	57947	54.5%	1.05	
Level of Education Completed [Var:EDUCAG]						
Did not graduate High School	128845	24.0%	407970	76.0%	REF	
Graduated High School	359648	34.2%	690434	65.8%	0.61	0.000
Attended College or Technical School	552751	51.4%	523193	48.6%	0.30	
Graduated from College or Technical School	426740	60.4%	279405	39.6%	0.21	
Employment Status [Var:EMPLOY1]						
Employed for wages	733708	49.9%	737642	50.1%	0.33	
Self-employed	117817	47.5%	130147	52.5%	0.36	0.000
Out of work for 1 year or more	25052	29.6%	59649	70.4%	0.78	
Out of work for less than a year	32792	34.5%	62324	65.5%	0.62	
A homemaker	82539	43.3%	107960	56.7%	0.43	
A student	82182	53.7%	70740	46.3%	0.28	
Retired	278158	42.0%	384497	58.0%	0.45	
Unable to work	111445	24.7%	340649	75.3%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	74184	35.3%	136071	64.7%	REF	
\$10,000 to 14,999	47161	25.2%	139653	74.8%	1.61	0.000
\$15,000 to 19,999	82213	32.9%	167660	67.1%	1.11	
\$20,000 to 24,999	94671	32.4%	197591	67.6%	1.14	
\$25,000 to 34,999	125102	40.5%	183485	59.5%	0.80	
\$35,000 to 49,999	174933	45.6%	209003	54.4%	0.65	
\$50,000 to 74,999	224453	53.1%	197912	46.9%	0.48	
\$75,000 or more	416424	59.2%	287110	40.8%	0.38	
Don't know/Not sure	103321	30.6%	234623	69.4%	1.24	

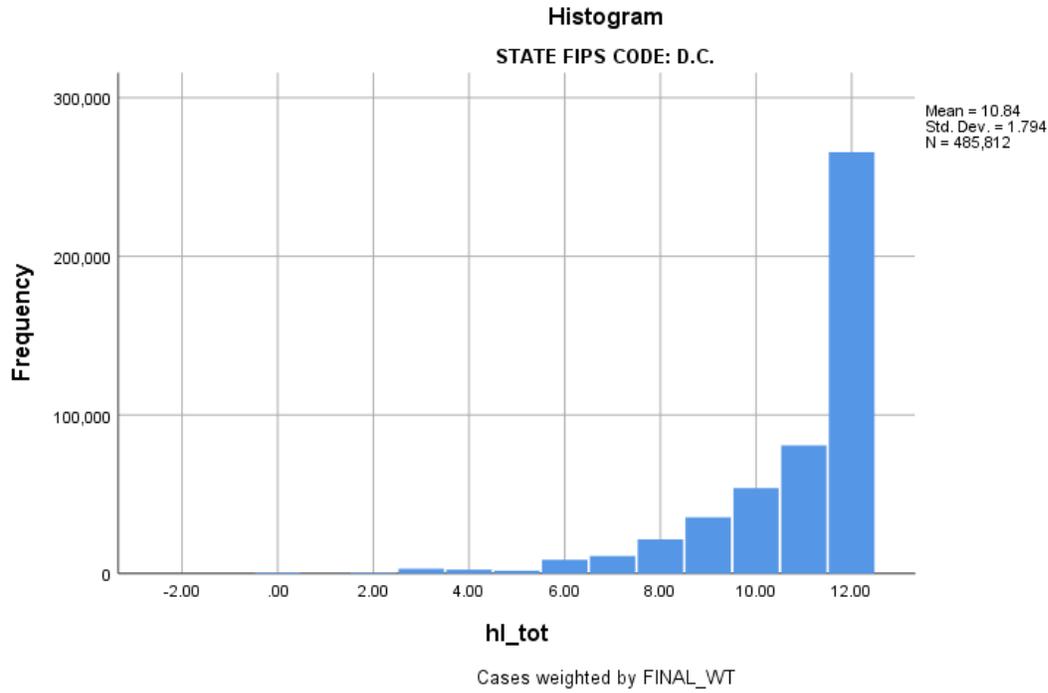
D.2 Alaska HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	<i>p</i> - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	91633	37.4%	153601	62.6%	1.39	0.000
Female	103856	45.4%	124951	54.6%	REF	
Age [Var:Sex]						
Ages 18 to 24	18651	31.8%	40010	68.2%	1.74	0.000
Ages 25 to 34	33667	36.9%	57469	63.1%	1.39	
Ages 35 to 44	38537	48.6%	40721	51.4%	0.86	
Ages 45 to 54	34411	41.3%	48814	58.7%	1.15	
Ages 55 to 64	36548	42.2%	50063	57.8%	1.11	
Ages 65 or older	33675	44.8%	41475	55.2%	REF	
Race [var:RACE]						
White	133855	43.8%	172017	56.2%	REF	0.000
Black	10919	53.0%	9671	47.0%	0.69	
American Indian or Alaskan Native	21332	34.8%	39893	65.2%	1.46	
Asian, Pacific Islander, Native Hawaiian	9769	33.5%	19400	66.5%	1.55	
Hispanic	6428	25.6%	18642	74.4%	2.26	
Multiracial, and other races	9427	41.4%	13355	58.6%	1.10	
Marital Status [Var:MARITAL]						
Married	109688	45.7%	130246	54.3%	REF	0.000

Divorced/Widowed/Separated	37523	39.8%	56671	60.2%	1.27	
Never married	39452	34.8%	73793	65.2%	1.58	
A member of an unmarried couple	7415	32.7%	15229	67.3%	1.73	
Level of Education Completed						
[Var:EDUCAG]						
Did not graduate High School	13184	33.5%	26222	66.5%	REF	
Graduated High School	38534	28.6%	96219	71.4%	1.26	
Attended College or Technical School	75192	42.1%	103370	57.9%	0.69	0.000
Graduated from College or Technical School	66460	55.9%	52440	44.1%	0.40	
Employment Status [Var:EMPLOY1]						
Employed for wages	102822	42.2%	140645	57.8%	0.47	
Self-employed	19590	38.8%	30933	61.2%	0.55	
Out of work for 1 year or more	3111	26.6%	8584	73.4%	0.95	
Out of work for less than a year	7009	28.9%	17229	71.1%	0.85	
A homemaker	13585	48.2%	14592	51.8%	0.37	0.000
A student	8154	44.9%	9990	55.1%	0.42	
Retired	33814	49.6%	34320	50.4%	0.35	
Unable to work	6246	25.7%	18083	74.3%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	2831	15.9%	14930	84.1%	REF	
\$10,000 to 14,999	10381	45.8%	12297	54.2%	0.22	
\$15,000 to 19,999	8471	37.6%	14082	62.4%	0.32	
\$20,000 to 24,999	9247	37.4%	15479	62.6%	0.32	
\$25,000 to 34,999	12283	34.9%	22926	65.1%	0.35	0.000
\$35,000 to 49,999	12726	24.5%	39234	75.5%	0.58	
\$50,000 to 74,999	22947	36.0%	40783	64.0%	0.34	
\$75,000 or more	101860	53.7%	87842	46.3%	0.16	
Don't know/Not sure	3595	15.8%	19198	84.2%	1.01	

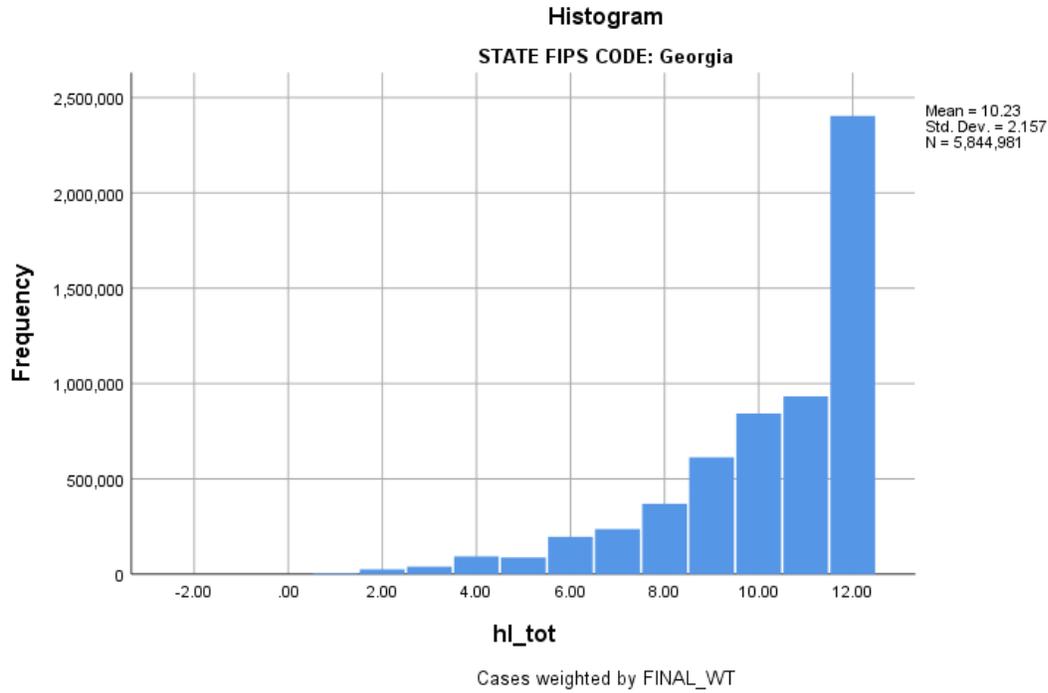
D.3 District of Columbia HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	<i>p</i> - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	122566	54.5%	102332	45.5%	1.02	0.001
Female	142877	55.0%	117083	45.0%	REF	
Age [Var:Sex]						
Ages 18 to 24	24611	44.2%	31116	55.8%	1.40	0.000
Ages 25 to 34	63899	54.0%	54504	46.0%	0.94	
Ages 35 to 44	53000	60.2%	35073	39.8%	0.73	
Ages 45 to 54	45199	60.3%	29713	39.7%	0.73	
Ages 55 to 64	37188	53.7%	32123	46.3%	0.95	
Ages 65 or older	41673	52.5%	37713	47.5%	REF	
Race [var:RACE]						
White	110251	62.9%	65132	37.1%	REF	0.000
Black	110813	51.4%	104905	48.6%	1.60	
American Indian or Alaskan Native	1211	39.7%	1841	60.3%	2.57	
Asian, Pacific Islander, Native	5861	43.6%	7595	56.4%	2.19	
Hawaiian						
Hispanic	21380	43.2%	28147	56.8%	2.23	
Multiracial, and other races	10474	58.4%	7461	41.6%	1.21	
Marital Status [Var:MARITAL]						
Married	89267	62.4%	53883	37.6%	REF	0.000

Divorced/Widowed/Separated	40240	45.0%	49174	55.0%	2.02	
Never married	117478	53.4%	102528	46.6%	1.45	
A member of an unmarried couple	15603	58.8%	10922	41.2%	1.16	
Level of Education Completed						
[Var:EDUCAG]						
Did not graduate High School	15933	30.7%	36037	69.3%	REF	
Graduated High School	44206	45.9%	52088	54.1%	0.52	
Attended College or Technical School	55973	55.6%	44631	44.4%	0.35	0.000
Graduated from College or Technical School	148800	63.4%	85946	36.6%	0.26	
Employment Status [Var:EMPLOY1]						
Employed for wages	157462	60.3%	103756	39.7%	0.38	
Self-employed	27472	55.8%	21754	44.2%	0.46	
Out of work for 1 year or more	7846	35.3%	14395	64.7%	1.06	
Out of work for less than a year	8171	53.4%	7143	46.6%	0.50	0.000
A homemaker	4756	61.8%	2939	38.2%	0.36	
A student	11226	40.2%	16728	59.8%	0.86	
Retired	36237	52.1%	33325	47.9%	0.53	
Unable to work	10119	36.5%	17585	63.5%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	7734	37.8%	12720	62.2%	REF	
\$10,000 to 14,999	6063	42.5%	8206	57.5%	0.82	
\$15,000 to 19,999	9263	41.7%	12938	58.3%	0.85	
\$20,000 to 24,999	11827	47.5%	13077	52.5%	0.67	
\$25,000 to 34,999	16155	49.4%	16528	50.6%	0.62	0.000
\$35,000 to 49,999	20267	54.3%	17049	45.7%	0.51	
\$50,000 to 74,999	29769	61.3%	18794	38.7%	0.38	
\$75,000 or more	111541	66.3%	56820	33.7%	0.31	
Don't know/Not sure	25066	36.7%	43287	63.3%	1.05	

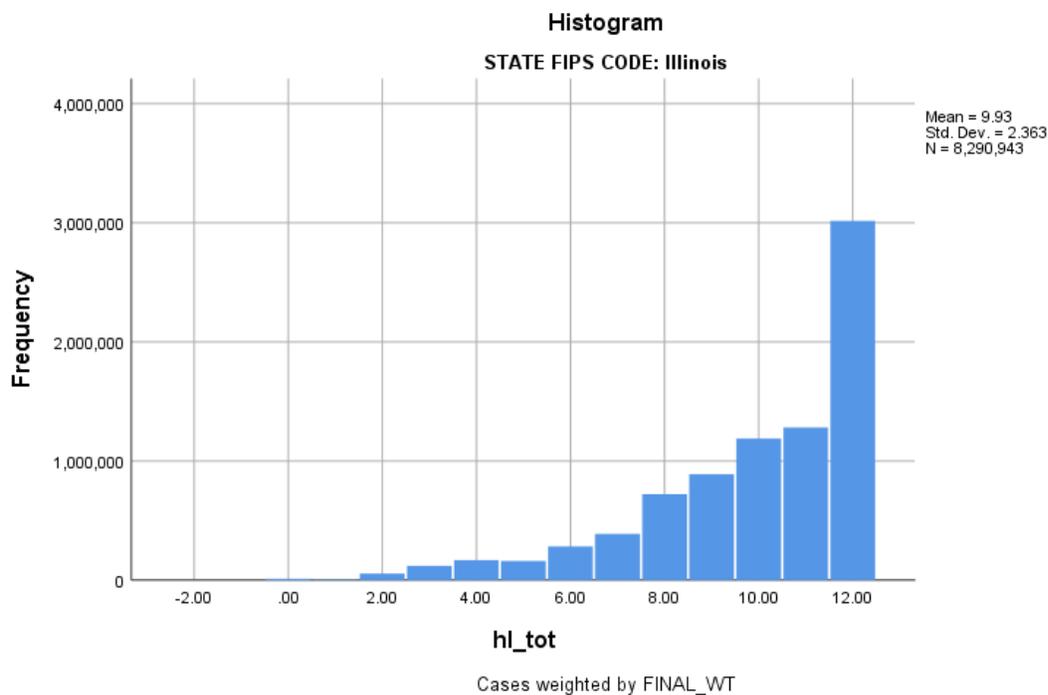
D.4 Georgia HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	p - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	1089148	39.1%	1699143	60.9%	1.18	0.000
Female	1314838	43.0%	1741852	57.0%	REF	
Age [Var:Sex]						
Ages 18 to 24	236544	33.8%	462945	66.2%	1.48	0.000
Ages 25 to 34	339250	40.3%	501769	59.7%	1.12	
Ages 35 to 44	404904	40.5%	595609	59.5%	1.11	
Ages 45 to 54	483141	42.9%	644355	57.1%	1.01	
Ages 55 to 64	435804	43.4%	568407	56.6%	0.98	
Ages 65 or older	504343	43.0%	667909	57.0%	REF	
Race [var:RACE]						
White	1429993	43.9%	1827909	56.1%	REF	0.000
Black	748278	43.3%	978823	56.7%	1.02	
American Indian or Alaskan Native	26749	47.5%	29546	52.5%	0.86	
Asian, Pacific Islander, Native Hawaiian	30826	18.6%	135028	81.4%	3.43	
Hispanic	90598	19.6%	370573	80.4%	3.20	
Multiracial, and other races	30560	42.4%	41561	57.6%	1.06	

Marital Status [Var:MARITAL]						
Married	1322194	44.7%	1636607	55.3%	REF	
Divorced/Widowed/Separated	466747	37.3%	784010	62.7%	1.36	
Never married	521057	37.6%	865326	62.4%	1.34	0.000
A member of an unmarried couple	64137	30.5%	146320	69.5%	1.84	
Level of Education Completed [Var:EDUCAG]						
Did not graduate High School	215825	22.6%	740521	77.4%	REF	
Graduated High School	621740	36.2%	1096502	63.8%	0.51	
Attended College or Technical School	809168	46.0%	949696	54.0%	0.34	0.000
Graduated from College or Technical School	756530	54.2%	640533	45.8%	0.25	
Employment Status [Var:EMPLOY1]						
Employed for wages	1209245	46.1%	1413110	53.9%	0.45	
Self-employed	190997	40.8%	276981	59.2%	0.56	
Out of work for 1 year or more	66139	31.7%	142232	68.3%	0.83	
Out of work for less than a year	43584	26.8%	119140	73.2%	1.05	0.000
A homemaker	132250	38.3%	213488	61.7%	0.62	
A student	110402	32.1%	233564	67.9%	0.82	
Retired	489801	43.3%	640222	56.7%	0.50	
Unable to work	143396	27.8%	371568	72.2%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	74792	25.4%	219604	74.6%	REF	
\$10,000 to 14,999	74470	25.4%	218870	74.6%	1.00	
\$15,000 to 19,999	146807	31.4%	320555	68.6%	0.74	
\$20,000 to 24,999	189463	33.0%	384310	67.0%	0.69	
\$25,000 to 34,999	181532	34.2%	349229	65.8%	0.66	0.000
\$35,000 to 49,999	281500	44.2%	355191	55.8%	0.43	
\$50,000 to 74,999	291923	45.3%	352436	54.7%	0.41	
\$75,000 or more	788986	55.5%	631540	44.5%	0.27	
Don't know/Not sure	143497	27.1%	385063	72.9%	0.91	

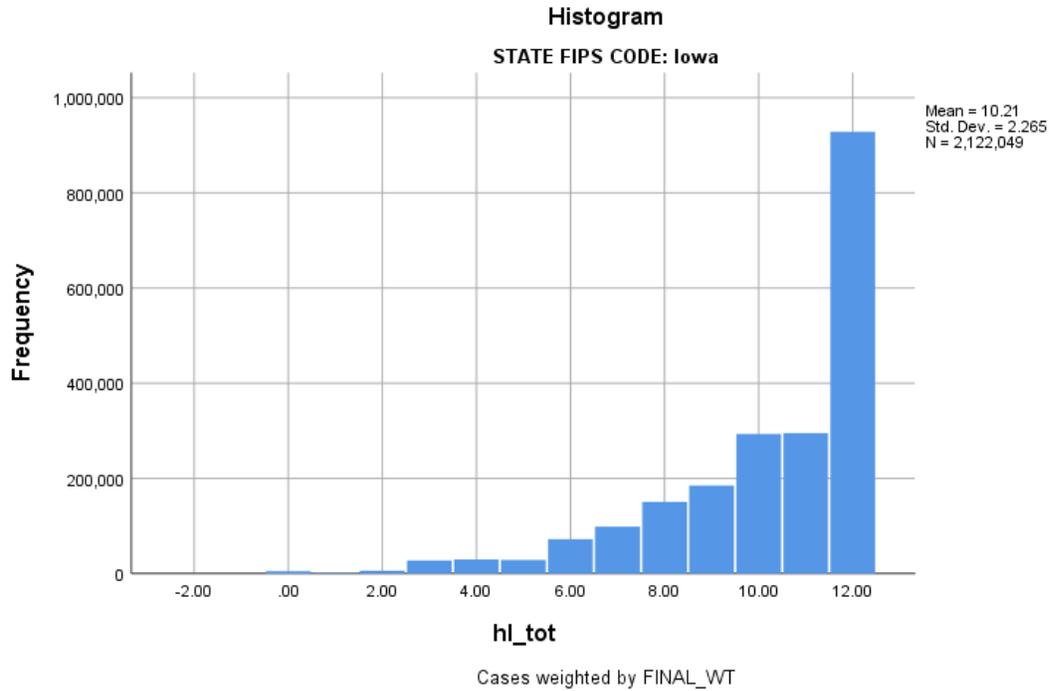
D.5 Illinois HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	p - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	1363344	34.3%	2617021	65.7%	1.19	0.000
Female	1652007	38.3%	2658571	61.7%	REF	
Age [Var:Sex]						
Ages 18 to 24	281841	27.1%	757186	72.9%	1.35	0.000
Ages 25 to 34	484760	39.5%	742173	60.5%	0.77	
Ages 35 to 44	502781	37.4%	841998	62.6%	0.84	
Ages 45 to 54	581237	39.5%	890127	60.5%	0.77	
Ages 55 to 64	583991	39.8%	884303	60.2%	0.76	
Ages 65 or older	580742	33.4%	1159805	66.6%	REF	
Race [var:RACE]						
White	2144597	39.8%	3237699	60.2%	REF	0.000
Black	428428	38.2%	694018	61.8%	1.07	
American Indian or Alaskan Native	9549	35.4%	17436	64.6%	1.21	
Asian, Pacific Islander, Native Hawaiian	125383	33.3%	250791	66.7%	1.32	
Hispanic	264174	21.5%	967394	78.5%	2.43	
Multiracial, and other races	37732	30.7%	85256	69.3%	1.50	

Marital Status [Var:MARITAL]						
Married	1796005	41.7%	2511849	58.3%	REF	
Divorced/Widowed/Separated	489915	31.4%	1069269	68.6%	1.56	
Never married	588236	29.8%	1388168	70.2%	1.69	0.000
A member of an unmarried couple	138846	32.5%	288130	67.5%	1.48	
Level of Education Completed [Var:EDUCAG]						
Did not graduate High School	163302	15.6%	883949	84.4%	REF	
Graduated High School	578983	25.0%	1738158	75.0%	0.55	
Attended College or Technical School	1070641	40.4%	1579530	59.6%	0.27	0.000
Graduated from College or Technical School	1202426	52.9%	1072287	47.1%	0.16	
Employment Status [Var:EMPLOY1]						
Employed for wages	1690130	41.0%	2427424	59.0%	0.40	
Self-employed	274723	38.8%	433512	61.2%	0.44	
Out of work for 1 year or more	65979	32.4%	137859	67.6%	0.58	
Out of work for less than a year	45126	26.7%	123802	73.3%	0.76	0.000
A homemaker	152740	29.0%	373520	71.0%	0.68	
A student	129449	25.0%	387679	75.0%	0.83	
Retired	547648	35.6%	992386	64.4%	0.50	
Unable to work	107062	21.7%	386944	78.3%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	80552	20.2%	319026	79.8%	REF	
\$10,000 to 14,999	62995	20.2%	248337	79.8%	1.00	
\$15,000 to 19,999	142148	25.3%	420623	74.7%	0.75	
\$20,000 to 24,999	136591	19.7%	555550	80.3%	1.03	
\$25,000 to 34,999	205406	28.2%	523954	71.8%	0.64	0.000
\$35,000 to 49,999	401467	36.2%	707103	63.8%	0.44	
\$50,000 to 74,999	486475	38.5%	776576	61.5%	0.40	
\$75,000 or more	1335935	48.8%	1402236	51.2%	0.27	
Don't know/Not sure	74456	26.6%	205429	73.4%	0.70	

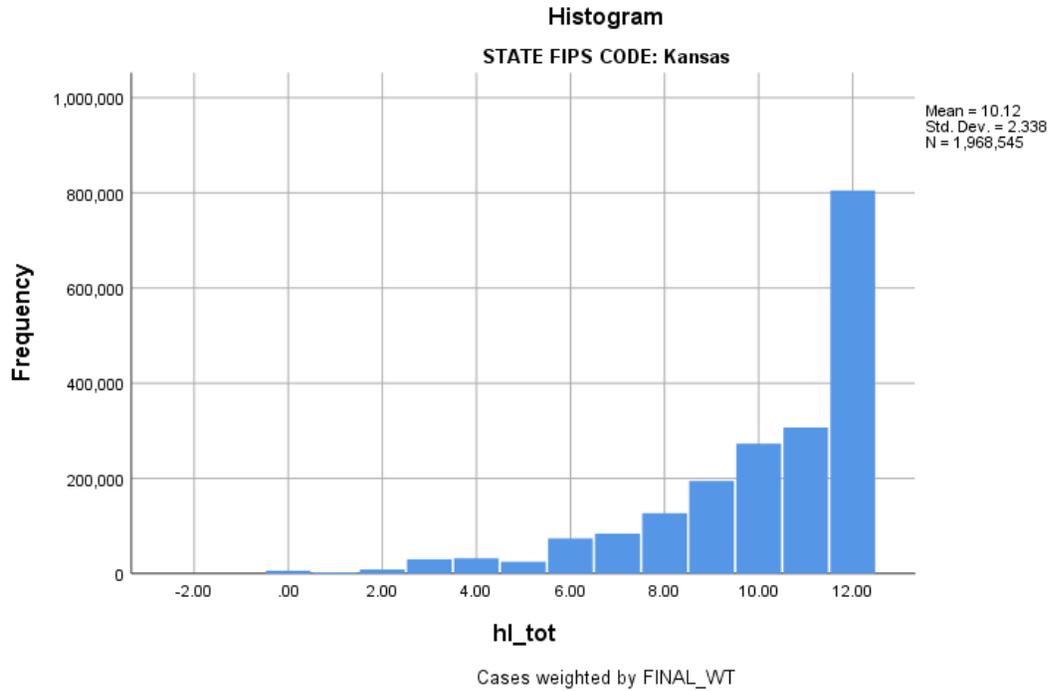
D.6 Iowa HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	<i>p</i> - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	403941	38.8%	637374	61.2%	1.49	0.000
Female	524511	48.5%	556223	51.5%	REF	
Age [Var:Sex]						
Ages 18 to 24	94746	34.1%	183415	65.9%	1.20	0.000
Ages 25 to 34	158554	49.5%	161979	50.5%	0.63	
Ages 35 to 44	160314	47.7%	175638	52.3%	0.68	
Ages 45 to 54	163694	47.4%	181546	52.6%	0.69	
Ages 55 to 64	172348	45.9%	203358	54.1%	0.73	
Ages 65 or older	178796	38.3%	287661	61.7%	REF	
Race [var:RACE]						
White	845503	44.9%	1036218	55.1%	REF	0.000
Black	21113	43.9%	27005	56.1%	1.04	
American Indian or Alaskan Native	6345	45.7%	7530	54.3%	0.97	
Asian, Pacific Islander, Native Hawaiian	9273	26.4%	25811	73.6%	2.27	
Hispanic	23023	26.2%	64688	73.8%	2.29	
Multiracial, and other races	13422	38.5%	21454	61.5%	1.30	
Marital Status [Var:MARITAL]						

Married	561032	47.2%	628057	52.8%	REF	
Divorced/Widowed/Separated	162337	39.5%	248966	60.5%	1.37	
Never married	163560	37.7%	269730	62.3%	1.47	0.000
A member of an unmarried couple	37403	46.2%	43499	53.8%	1.04	
Level of Education Completed						
[Var:EDUCAG]						
Did not graduate High School	32881	19.2%	138705	80.8%	REF	
Graduated High School	221703	33.3%	444515	66.7%	0.48	
Attended College or Technical School	371038	48.2%	398166	51.8%	0.25	0.000
Graduated from College or Technical School	301881	58.8%	211332	41.2%	0.17	
Employment Status						
[Var:EMPLOY1]						
Employed for wages	556615	48.8%	584340	51.2%	0.47	
Self-employed	80355	39.0%	125753	61.0%	0.70	
Out of work for 1 year or more	7825	27.8%	20297	72.2%	1.16	
Out of work for less than a year	14211	31.9%	30385	68.1%	0.96	0.000
A homemaker	33682	40.0%	50519	60.0%	0.67	
A student	47113	39.8%	71227	60.2%	0.68	
Retired	159196	39.2%	247352	60.8%	0.70	
Unable to work	25724	30.9%	57411	69.1%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	11574	19.3%	48497	80.7%	REF	
\$10,000 to 14,999	19644	29.1%	47803	70.9%	0.58	
\$15,000 to 19,999	39314	33.9%	76597	66.1%	0.46	
\$20,000 to 24,999	44491	33.6%	88074	66.4%	0.47	
\$25,000 to 34,999	66794	36.9%	114135	63.1%	0.41	0.000
\$35,000 to 49,999	112590	41.0%	161846	59.0%	0.34	
\$50,000 to 74,999	176474	47.2%	197736	52.8%	0.27	
\$75,000 or more	356494	56.5%	274127	43.5%	0.18	
Don't know/Not sure	49150	30.1%	113915	69.9%	0.55	

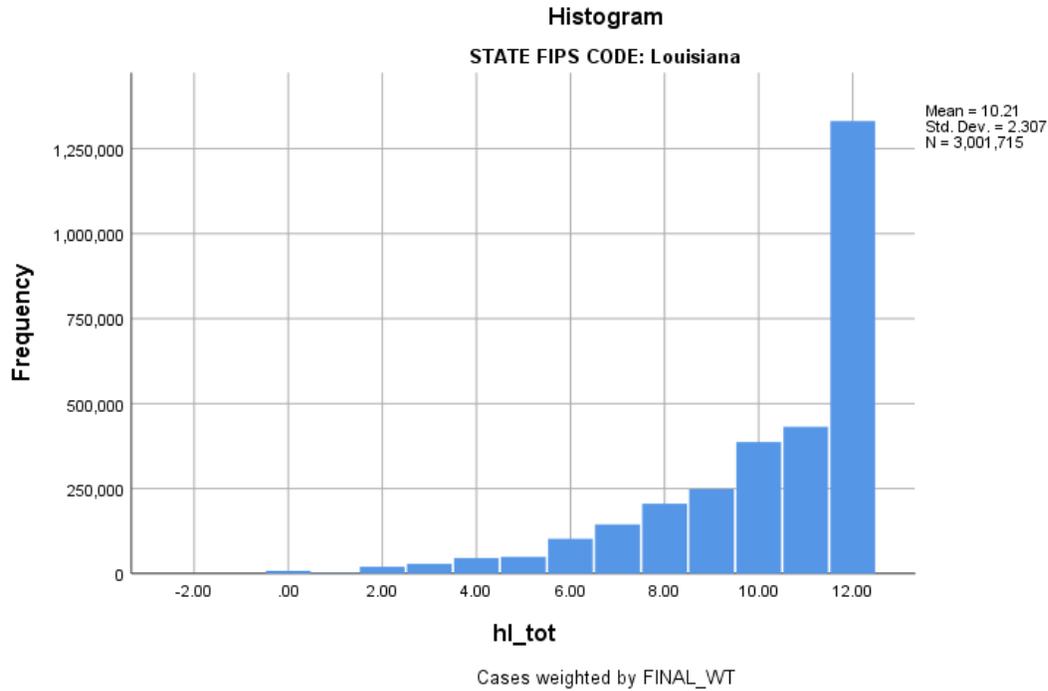
D.7 Kansas HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	p - χ^2	
	N	%	N	%			
Sex [Var:Sex]							
Male	364686	37.9%	596898	62.1%	1.27	0.000	
Female	440145	43.7%	566057	56.3%	REF		
Age [Var:Sex]							
Ages 18 to 24	96413	34.0%	187492	66.0%	1.21	0.000	
Ages 25 to 34	134068	40.9%	193503	59.1%	0.90		
Ages 35 to 44	155284	49.4%	159317	50.6%	0.64		
Ages 45 to 54	125133	40.3%	185251	59.7%	0.92		
Ages 55 to 64	140715	42.4%	191492	57.6%	0.85		
Ages 65 or older	153218	38.3%	246658	61.7%	REF		
Race [var:RACE]							
White	677991	43.5%	880434	56.5%	REF	0.000	
Black	41905	37.5%	69747	62.5%	1.28		
American Indian or Alaskan Native	11422	42.1%	15698	57.9%	1.06		
Asian, Pacific Islander, Native Hawaiian	7321	28.8%	18131	71.2%	1.91		
Hispanic	40324	23.4%	131842	76.6%	2.52		
Multiracial, and other races	20029	37.3%	33597	62.7%	1.29		
Marital Status [Var:MARITAL]							

Married	476018	44.6%	591304	55.4%	REF	
Divorced/Widowed/Separated	144163	36.9%	246480	63.1%	1.38	
Never married	150250	36.3%	263763	63.7%	1.41	0.000
A member of an unmarried couple	31833	37.6%	52727	62.4%	1.33	
Level of Education Completed [Var:EDUCAG]						
Did not graduate High School	42713	21.1%	159493	78.9%	REF	
Graduated High School	157117	30.6%	356431	69.4%	0.61	
Attended College or Technical School	300746	43.1%	396525	56.9%	0.35	0.000
Graduated from College or Technical School	302888	54.9%	249048	45.1%	0.22	
Employment Status [Var:EMPLOY1]						
Employed for wages	466848	44.9%	574058	55.1%	0.37	
Self-employed	62846	37.4%	105185	62.6%	0.50	
Out of work for 1 year or more	11927	32.9%	24320	67.1%	0.61	
Out of work for less than a year	12880	32.2%	27117	67.8%	0.63	0.000
A homemaker	47159	37.8%	77555	62.2%	0.49	
A student	36529	38.5%	58281	61.5%	0.48	
Retired	139132	40.1%	207475	59.9%	0.45	
Unable to work	22787	23.1%	76065	76.9%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	13513	21.2%	50277	78.8%	REF	
\$10,000 to 14,999	15451	26.2%	43590	73.8%	0.76	
\$15,000 to 19,999	33212	30.2%	76745	69.8%	0.62	
\$20,000 to 24,999	43133	27.7%	112797	72.3%	0.70	
\$25,000 to 34,999	69047	35.0%	128317	65.0%	0.50	0.000
\$35,000 to 49,999	101489	41.8%	141054	58.2%	0.37	
\$50,000 to 74,999	133784	44.9%	164427	55.1%	0.33	
\$75,000 or more	291719	55.2%	236618	44.8%	0.22	
Don't know/Not sure	57381	28.5%	143944	71.5%	0.67	

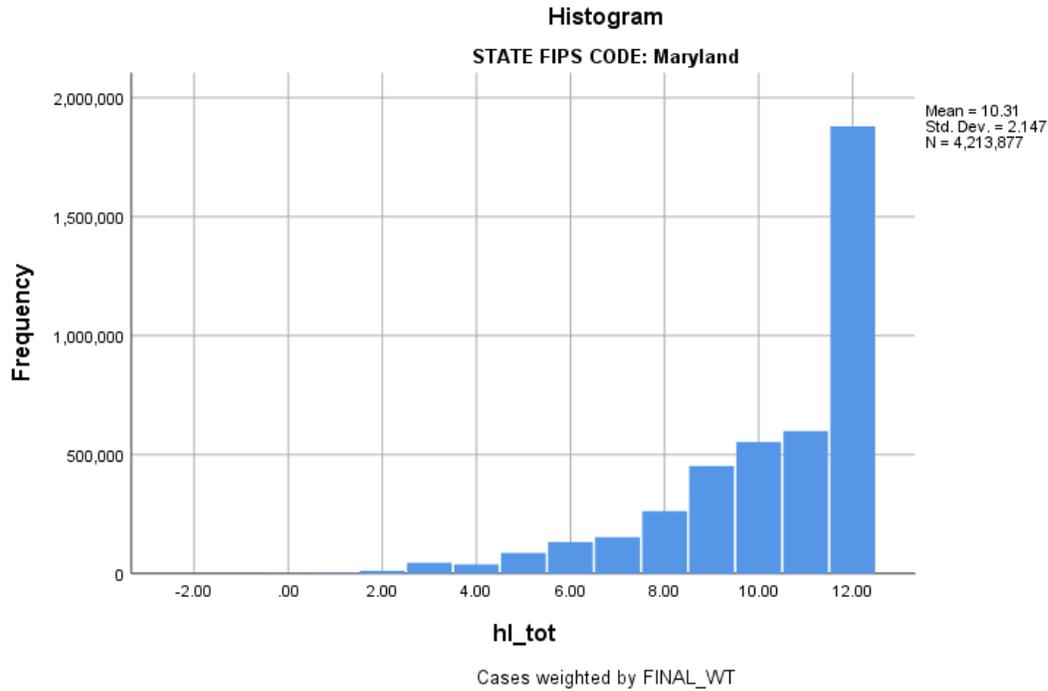
D.8 Louisiana HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	<i>p</i> - χ^2	
	N	%	N	%			
Sex [Var:Sex]							
Male	592362	41.1%	847919	58.9%	1.29	0.000	
Female	739040	47.3%	822393	52.7%	REF		
Age [Var:Sex]							
Ages 18 to 24	132760	36.5%	231339	63.5%	1.23	0.000	
Ages 25 to 34	239475	47.7%	262613	52.3%	0.77		
Ages 35 to 44	252778	51.4%	239093	48.6%	0.67		
Ages 45 to 54	224820	43.6%	290596	56.4%	0.91		
Ages 55 to 64	232967	44.2%	294120	55.8%	0.89		
Ages 65 or older	248602	41.4%	352551	58.6%	REF		
Race [var:RACE]							
White	817377	44.5%	1019171	55.5%	REF	0.000	
Black	409963	45.5%	490862	54.5%	0.96		
American Indian or Alaskan Native	19131	53.1%	16876	46.9%	0.71		
Asian, Pacific Islander, Native Hawaiian	3275	17.7%	15219	82.3%	3.73		
Hispanic	44652	39.8%	67611	60.2%	1.21		
Multiracial, and other races	21113	47.0%	23813	53.0%	0.90		
Marital Status [Var:MARITAL]							

Married	697381	49.6%	709186	50.4%	REF	
Divorced/Widowed/Separated	269737	38.4%	433470	61.6%	1.58	
Never married	311391	39.7%	472120	60.3%	1.49	0.000
A member of an unmarried couple	47337	49.2%	48810	50.8%	1.01	
Level of Education Completed						
[Var:EDUCAG]						
Did not graduate High School	153753	30.3%	353343	69.7%	REF	
Graduated High School	376869	36.4%	659028	63.6%	0.76	
Attended College or Technical School	412008	49.4%	421349	50.6%	0.45	0.000
Graduated from College or Technical School	388029	62.9%	229038	37.1%	0.26	
Employment Status						
[Var:EMPLOY1]						
Employed for wages	639887	48.2%	688479	51.8%	0.39	
Self-employed	136293	50.3%	134581	49.7%	0.36	
Out of work for 1 year or more	33804	34.6%	64013	65.4%	0.68	
Out of work for less than a year	56899	49.5%	58069	50.5%	0.37	0.000
A homemaker	86425	42.5%	117070	57.5%	0.49	
A student	57973	39.3%	89403	60.7%	0.56	
Retired	231553	45.4%	277957	54.6%	0.43	
Unable to work	83767	26.5%	232503	73.5%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	63782	30.3%	146898	69.7%	REF	
\$10,000 to 14,999	54349	33.6%	107462	66.4%	0.86	
\$15,000 to 19,999	75483	29.4%	181177	70.6%	1.04	
\$20,000 to 24,999	116463	41.8%	161948	58.2%	0.60	
\$25,000 to 34,999	130166	48.6%	137836	51.4%	0.46	0.000
\$35,000 to 49,999	167283	48.2%	179935	51.8%	0.47	
\$50,000 to 74,999	182046	50.4%	178855	49.6%	0.43	
\$75,000 or more	371916	53.4%	324636	46.6%	0.38	
Don't know/Not sure	91343	36.5%	159009	63.5%	0.76	

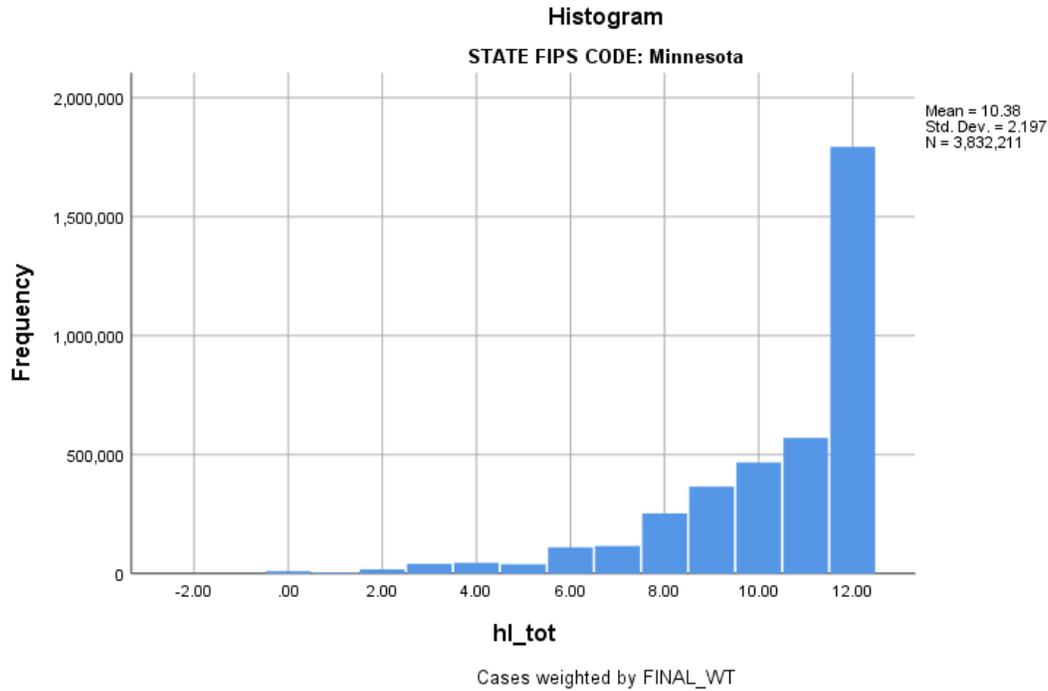
D.9 Maryland HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	<i>p</i> - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	834231	41.0%	1201842	59.0%	1.33	0.000
Female	1044694	48.0%	1133110	52.0%	REF	
Age [Var:Sex]						
Ages 18 to 24	182448	35.7%	329277	64.3%	1.39	0.000
Ages 25 to 34	307165	41.8%	427319	58.2%	1.07	
Ages 35 to 44	341366	49.2%	352432	50.8%	0.80	
Ages 45 to 54	372203	49.7%	377447	50.3%	0.78	
Ages 55 to 64	323504	45.3%	391246	54.7%	0.93	
Ages 65 or older	352240	43.5%	457230	56.5%	REF	
Race [var:RACE]						
White	1058587	46.5%	1216516	53.5%	REF	0.000
Black	550808	47.5%	607729	52.5%	0.96	
American Indian or Alaskan Native	19526	45.7%	23236	54.3%	1.04	
Asian, Pacific Islander, Native Hawaiian	100962	39.2%	156867	60.8%	1.35	
Hispanic	76735	22.4%	266402	77.6%	3.02	
Multiracial, and other races	35762	45.9%	42223	54.1%	1.03	
Marital Status [Var:MARITAL]						

Married	1019691	49.8%	1028301	50.2%	REF	
Divorced/Widowed/Separated	344414	42.1%	473148	57.9%	1.36	0.000
Never married	451050	39.3%	696327	60.7%	1.53	
A member of an unmarried couple	58233	31.9%	124449	68.1%	2.12	
Level of Education Completed						
[Var:EDUCAG]						
Did not graduate High School	86112	19.7%	349904	80.3%	REF	
Graduated High School	404183	36.7%	696870	63.3%	0.42	
Attended College or Technical School	553637	46.7%	631705	53.3%	0.28	0.000
Graduated from College or Technical School	832817	56.1%	650523	43.9%	0.19	
Employment Status [Var:EMPLOY1]						
Employed for wages	1078763	48.2%	1160946	51.8%	0.52	
Self-employed	118312	38.2%	191734	61.8%	0.79	
Out of work for 1 year or more	30589	37.6%	50671	62.4%	0.81	
Out of work for less than a year	49387	35.9%	88269	64.1%	0.87	0.000
A homemaker	89633	43.1%	118486	56.9%	0.64	
A student	92978	35.2%	171098	64.8%	0.90	
Retired	327635	45.5%	393010	54.5%	0.58	
Unable to work	71877	32.8%	147409	67.2%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	37475	31.7%	80685	68.3%	REF	
\$10,000 to 14,999	45394	33.8%	89052	66.2%	0.91	
\$15,000 to 19,999	50030	22.9%	168221	77.1%	1.56	
\$20,000 to 24,999	67503	28.6%	168261	71.4%	1.16	
\$25,000 to 34,999	88045	34.6%	166297	65.4%	0.88	0.000
\$35,000 to 49,999	173534	45.2%	210736	54.8%	0.56	
\$50,000 to 74,999	244102	43.3%	319992	56.7%	0.61	
\$75,000 or more	899029	57.0%	679072	43.0%	0.35	
Don't know/Not sure	138463	32.3%	289793	67.7%	0.97	

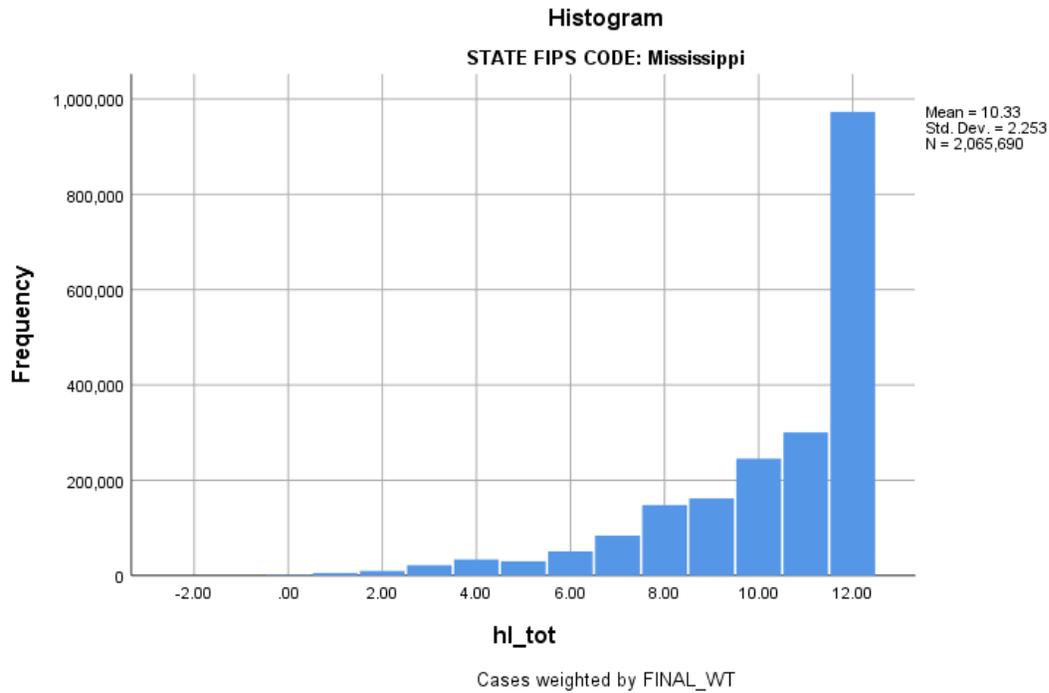
D.10 Minnesota HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	p - χ^2	
	N	%	N	%			
Sex [Var:Sex]							
Male	767158	40.9%	1109982	59.1%	1.60	0.000	
Female	1026069	52.5%	929002	47.5%	REF		
Age [Var:Sex]							
Ages 18 to 24	181499	40.0%	272482	60.0%	1.18	0.000	
Ages 25 to 34	280398	45.2%	340214	54.8%	0.95		
Ages 35 to 44	314348	50.3%	310028	49.7%	0.78		
Ages 45 to 54	332513	50.1%	331438	49.9%	0.78		
Ages 55 to 64	338432	49.5%	344977	50.5%	0.80		
Ages 65 or older	346036	44.0%	439845	56.0%	REF		
Race [var:RACE]							
White	1552166	48.6%	1642623	51.4%	REF	0.000	
Black	81288	44.9%	99673	55.1%	1.16		
American Indian or Alaskan Native	12637	31.9%	27012	68.1%	2.02		
Asian, Pacific Islander, Native Hawaiian	65328	40.0%	98104	60.0%	1.42		
Hispanic	41455	26.1%	117623	73.9%	2.68		
Multiracial, and other races	23063	48.8%	24176	51.2%	0.99		
Marital Status [Var:MARITAL]							

Married	1071341	51.0%	1030190	49.0%	REF	
Divorced/Widowed/Separated	288000	42.5%	388930	57.5%	1.40	
Never married	353384	40.6%	516740	59.4%	1.52	0.000
A member of an unmarried couple	73886	45.9%	86927	54.1%	1.22	
Level of Education Completed [Var:EDUCAG]						
Did not graduate High School	65009	20.6%	249912	79.4%	REF	
Graduated High School	368788	36.3%	646210	63.7%	0.46	
Attended College or Technical School	631987	47.9%	687520	52.1%	0.28	0.000
Graduated from College or Technical School	725189	61.7%	449664	38.3%	0.16	
Employment Status [Var:EMPLOY1]						
Employed for wages	1049372	49.9%	1054784	50.1%	0.45	
Self-employed	144497	44.4%	181148	55.6%	0.56	
Out of work for 1 year or more	19745	34.4%	37698	65.6%	0.85	
Out of work for less than a year	29804	35.0%	55313	65.0%	0.83	0.000
A homemaker	69376	46.8%	78975	53.2%	0.51	
A student	80665	45.2%	97788	54.8%	0.54	
Retired	340335	45.9%	401227	54.1%	0.52	
Unable to work	48675	30.8%	109364	69.2%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	28786	29.7%	68248	70.3%	REF	
\$10,000 to 14,999	32933	31.5%	71492	68.5%	0.92	
\$15,000 to 19,999	59366	33.9%	115997	66.1%	0.82	
\$20,000 to 24,999	97138	36.7%	167839	63.3%	0.73	
\$25,000 to 34,999	128344	40.4%	189648	59.6%	0.62	0.000
\$35,000 to 49,999	202009	42.3%	275781	57.7%	0.58	
\$50,000 to 74,999	284473	48.5%	302219	51.5%	0.45	
\$75,000 or more	776722	59.4%	530711	40.6%	0.29	
Don't know/Not sure	89661	30.9%	200634	69.1%	0.94	

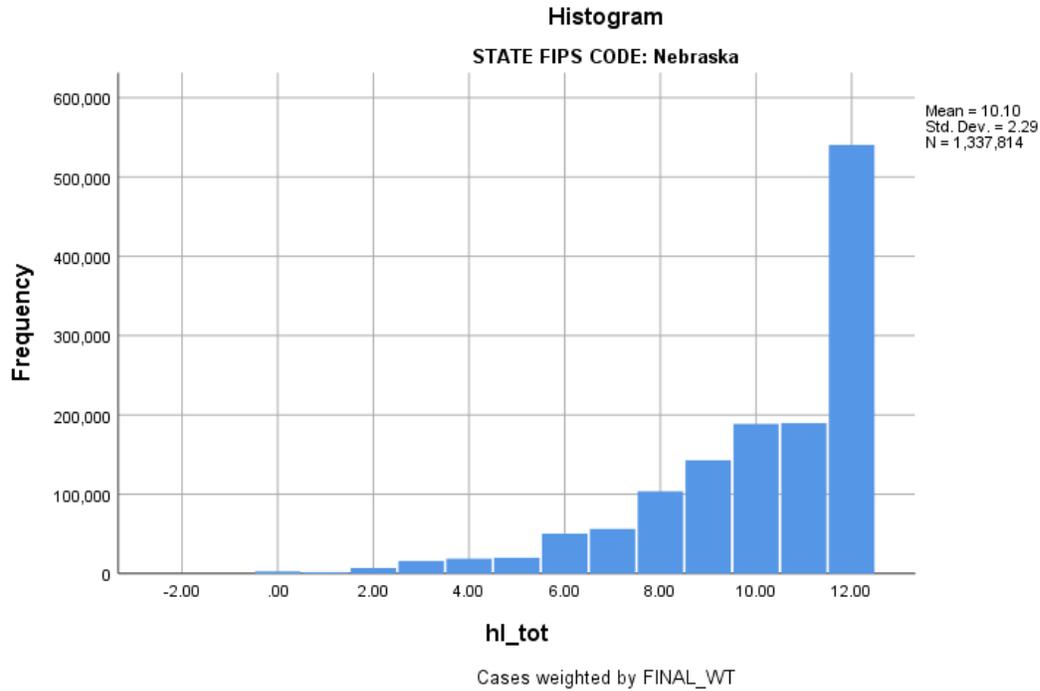
D.11 Mississippi HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	p - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	431511	44.1%	546186	55.9%	1.25	0.000
Female	541663	49.8%	546330	50.2%	REF	
Age [Var:Sex]						
Ages 18 to 24	126267	48.3%	135269	51.7%	0.76	0.000
Ages 25 to 34	186781	54.2%	158106	45.8%	0.60	
Ages 35 to 44	169569	50.9%	163277	49.1%	0.68	
Ages 45 to 54	151079	44.5%	188468	55.5%	0.88	
Ages 55 to 64	160541	45.3%	193837	54.7%	0.85	
Ages 65 or older	178937	41.4%	253559	58.6%	REF	
Race [var:RACE]						
White	590493	48.2%	635191	51.8%	REF	0.000
Black	328476	45.0%	401593	55.0%	1.14	
American Indian or Alaskan Native	8837	56.2%	6875	43.8%	0.72	
Asian, Pacific Islander, Native Hawaiian	7371	63.2%	4287	36.8%	0.54	
Hispanic	20968	42.6%	28208	57.4%	1.25	
Multiracial, and other races	10368	55.8%	8216	44.2%	0.74	
Marital Status [Var:MARITAL]						
Married	501817	50.5%	491157	49.5%	REF	0.000

Divorced/Widowed/Separated	193306	40.0%	289938	60.0%	1.53	
Never married	256932	47.1%	288295	52.9%	1.15	
A member of an unmarried couple	18177	45.5%	21815	54.5%	1.23	
Level of Education Completed [Var:EDUCAG]						
Did not graduate High School	104846	28.2%	266938	71.8%	REF	
Graduated High School	240799	38.8%	379147	61.2%	0.62	
Attended College or Technical School	374687	54.3%	315692	45.7%	0.33	0.000
Graduated from College or Technical School	251301	66.2%	128493	33.8%	0.20	
Employment Status [Var:EMPLOY1]						
Employed for wages	509818	53.3%	447544	46.7%	0.38	
Self-employed	64589	46.5%	74205	53.5%	0.49	
Out of work for 1 year or more	20074	35.5%	36409	64.5%	0.78	
Out of work for less than a year	19747	33.9%	38450	66.1%	0.84	
A homemaker	50630	52.5%	45725	47.5%	0.39	0.000
A student	47087	60.4%	30838	39.6%	0.28	
Retired	177640	43.9%	226598	56.1%	0.55	
Unable to work	82006	30.1%	190532	69.9%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	35105	25.1%	104523	74.9%	REF	
\$10,000 to 14,999	43654	37.5%	72654	62.5%	0.56	
\$15,000 to 19,999	82472	40.1%	123318	59.9%	0.50	
\$20,000 to 24,999	90087	41.9%	124815	58.1%	0.47	
\$25,000 to 34,999	99521	45.1%	121330	54.9%	0.41	0.000
\$35,000 to 49,999	128848	53.8%	110814	46.2%	0.29	
\$50,000 to 74,999	126685	56.0%	99714	44.0%	0.26	
\$75,000 or more	209076	62.5%	125686	37.5%	0.20	
Don't know/Not sure	104633	40.4%	154575	59.6%	0.50	

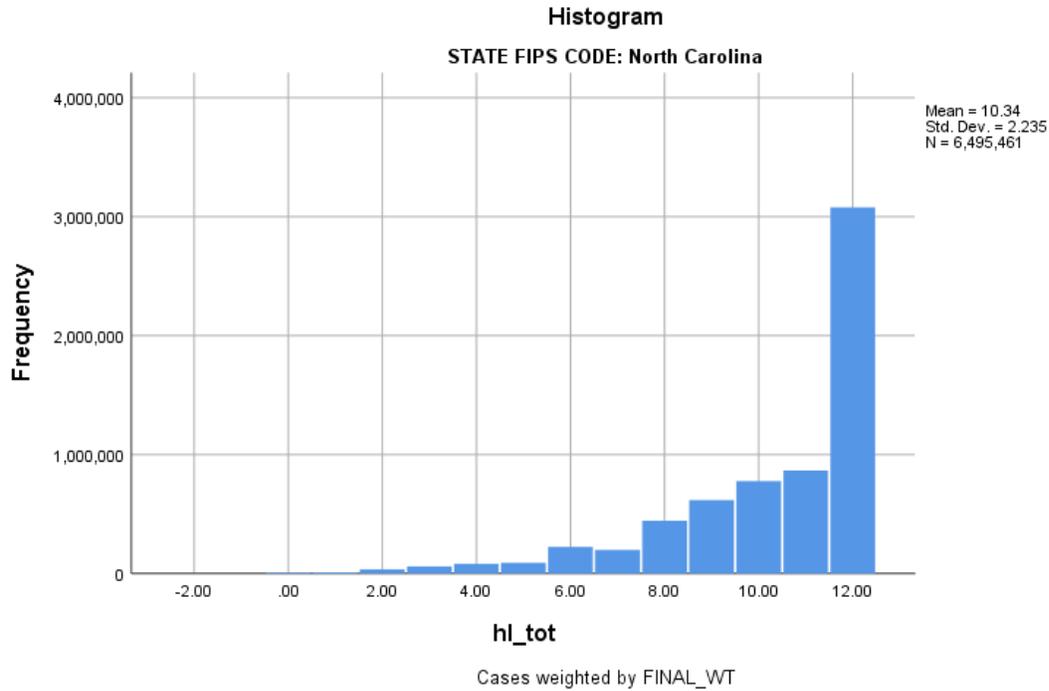
D.12 Nebraska HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	<i>p</i> - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	229589	34.9%	428024	65.1%	1.569	0.000
Female	310839	45.7%	369362	54.3%	REF	
Age [Var:Sex]						
Ages 18 to 24	54532	31.1%	120811	68.9%	1.184	0.000
Ages 25 to 34	96541	42.2%	132034	57.8%	.731	
Ages 35 to 44	97521	45.2%	118447	54.8%	.649	
Ages 45 to 54	98357	45.4%	118073	54.6%	.642	
Ages 55 to 64	98029	43.1%	129443	56.9%	.706	
Ages 65 or older	95447	34.8%	178578	65.2%	REF	
Race [var:RACE]						
White	469770	42.3%	639706	57.7%	REF	0.000
Black	23172	45.3%	27966	54.7%	.886	
American Indian or Alaskan Native	6817	50.2%	6752	49.8%	.727	
Asian, Pacific Islander, Native Hawaiian	5964	27.9%	15424	72.1%	1.899	
Hispanic	22705	20.6%	87712	79.4%	2.837	
Multiracial, and other races	9325	46.6%	10694	53.4%	.842	
Marital Status [Var:MARITAL]						

Married	338014	45.0%	412492	55.0%	REF	
Divorced/Widowed/Separated	85302	34.4%	162643	65.6%	1.562	0.000
Never married	97365	34.3%	186556	65.7%	1.570	
A member of an unmarried couple	18899	35.7%	33998	64.3%	1.474	
Level of Education Completed						
[Var:EDUCAG]						
Did not graduate High School	21075	16.3%	108190	83.7%	REF	
Graduated High School	106795	29.1%	260037	70.9%	.474	
Attended College or Technical School	201434	41.9%	278830	58.1%	.270	0.000
Graduated from College or Technical School	210440	58.4%	149838	41.6%	.139	
Employment Status [Var:EMPLOY1]						
Employed for wages	307182	44.1%	388726	55.9%	.517	
Self-employed	61153	39.8%	92425	60.2%	.617	
Out of work for 1 year or more	3467	21.2%	12883	78.8%	1.518	
Out of work for less than a year	11584	37.8%	19051	62.2%	.672	0.000
A homemaker	30614	40.3%	45395	59.7%	.606	
A student	26078	33.7%	51376	66.3%	.805	
Retired	81448	36.4%	142114	63.6%	.713	
Unable to work	17812	29.0%	43602	71.0%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	14057	32.4%	29297	67.6%	REF	
\$10,000 to 14,999	12355	25.3%	36416	74.7%	1.414	
\$15,000 to 19,999	19412	25.4%	56975	74.6%	1.408	
\$20,000 to 24,999	31442	28.6%	78657	71.4%	1.200	
\$25,000 to 34,999	41510	30.4%	95135	69.6%	1.100	0.000
\$35,000 to 49,999	73370	39.1%	114398	60.9%	.748	
\$50,000 to 74,999	88334	42.5%	119430	57.5%	.649	
\$75,000 or more	219281	56.1%	171775	43.9%	.376	
Don't know/Not sure	18837	23.3%	62017	76.7%	1.580	

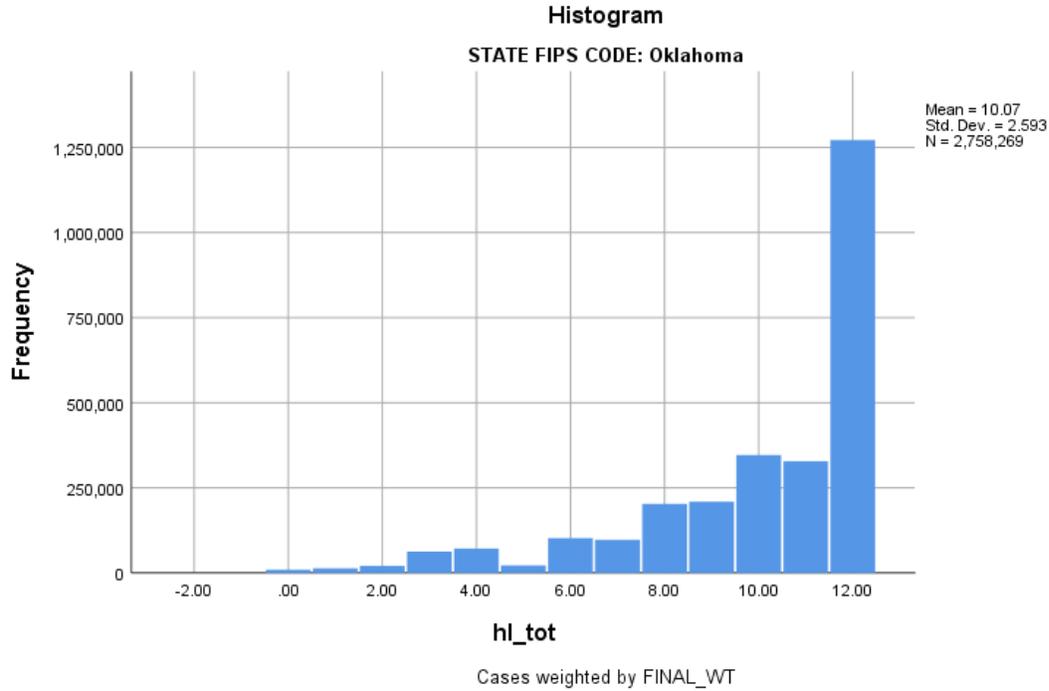
D.13 North Carolina HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	p - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	1345728	44.1%	1705051	55.9%	1.28	0.000
Female	1730870	50.3%	1711914	49.7%	REF	
Age [Var:Sex]						
Ages 18 to 24	328801	46.4%	380404	53.6%	0.82	0.000
Ages 25 to 34	453370	48.3%	485986	51.7%	0.76	
Ages 35 to 44	554464	52.7%	497708	47.3%	0.63	
Ages 45 to 54	568123	48.1%	614038	51.9%	0.76	
Ages 55 to 64	565197	49.4%	579131	50.6%	0.72	
Ages 65 or older	607308	41.4%	860930	58.6%	REF	
Race [var:RACE]						
White	2101743	48.9%	2198398	51.1%	REF	0.000
Black	664324	48.4%	707962	51.6%	1.02	
American Indian or Alaskan Native	29925	38.8%	47120	61.2%	1.51	
Asian, Pacific Islander, Native Hawaiian	47740	36.2%	84285	63.8%	1.69	
Hispanic	149362	32.0%	317472	68.0%	2.03	
Multiracial, and other races	50504	59.5%	34340	40.5%	0.65	
Marital Status [Var:MARITAL]						
Married	1754069	52.1%	1613220	47.9%	REF	0.000

Divorced/Widowed/Separated	598484	40.5%	879893	59.5%	1.60	
Never married	636389	45.0%	776894	55.0%	1.33	
A member of an unmarried couple	75046	35.7%	134940	64.3%	1.96	
Level of Education Completed						
[Var:EDUCAG]						
Did not graduate High School	213606	21.2%	795569	78.8%	REF	
Graduated High School	696999	39.5%	1069399	60.5%	0.41	
Attended College or Technical School	1134349	52.6%	1020223	47.4%	0.24	0.000
Graduated from College or Technical School	1022925	66.3%	520710	33.7%	0.14	
Employment Status [Var:EMPLOY1]						
Employed for wages	1596133	54.0%	1361872	46.0%	0.29	
Self-employed	267468	50.9%	257863	49.1%	0.33	
Out of work for 1 year or more	48826	37.6%	81106	62.4%	0.56	
Out of work for less than a year	71432	47.6%	78741	52.4%	0.37	0.000
A homemaker	140805	46.6%	161283	53.4%	0.39	
A student	178807	47.1%	200633	52.9%	0.38	
Retired	600552	42.6%	810718	57.4%	0.46	
Unable to work	155050	25.3%	457167	74.7%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	72521	25.3%	214216	74.7%	REF	
\$10,000 to 14,999	83244	28.5%	208971	71.5%	0.85	
\$15,000 to 19,999	201748	35.8%	362115	64.2%	0.61	
\$20,000 to 24,999	178349	35.6%	322416	64.4%	0.61	
\$25,000 to 34,999	251510	41.5%	354889	58.5%	0.48	0.000
\$35,000 to 49,999	330331	45.4%	397923	54.6%	0.41	
\$50,000 to 74,999	513558	58.9%	358591	41.1%	0.24	
\$75,000 or more	927922	63.8%	526937	36.2%	0.19	
Don't know/Not sure	230457	37.2%	389747	62.8%	0.57	

D.14 Oklahoma HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	p - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	589105	43.8%	757182	56.2%	1.20	0.000
Female	682544	48.3%	729438	51.7%	REF	
Age [Var:Sex]						
Ages 18 to 24	143674	39.7%	218398	60.3%	1.19	0.000
Ages 25 to 34	234716	47.9%	255171	52.1%	0.85	
Ages 35 to 44	226254	49.8%	227925	50.2%	0.79	
Ages 45 to 54	207817	46.2%	241795	53.8%	0.91	
Ages 55 to 64	214905	48.1%	232053	51.9%	0.85	
Ages 65 or older	244283	44.0%	311279	56.0%	REF	
Race [var:RACE]						
White	923601	48.3%	988448	51.7%	REF	0.000
Black	110189	56.8%	83678	43.2%	0.71	
American Indian or Alaskan Native	96492	47.0%	108987	53.0%	1.06	
Asian, Pacific Islander, Native	21521	38.0%	35096	62.0%	1.52	
Hawaiian						
Hispanic	55302	23.5%	179911	76.5%	3.04	
Multiracial, and other races	56026	42.6%	75585	57.4%	1.26	

Marital Status [Var:MARITAL]

Married	739294	51.2%	704753	48.8%	REF	
Divorced/Widowed/Separated	259513	40.9%	374991	59.1%	1.52	0.000
Never married	237027	40.9%	342499	59.1%	1.52	
A member of an unmarried couple	32337	35.6%	58572	64.4%	1.90	

Level of Education Completed [Var:EDUCAG]

Did not graduate High School	84157	21.6%	306105	78.4%	REF	
Graduated High School	353466	41.7%	493828	58.3%	0.38	
Attended College or Technical School	464185	51.7%	433646	48.3%	0.26	0.000
Graduated from College or Technical School	368845	59.9%	246953	40.1%	0.18	

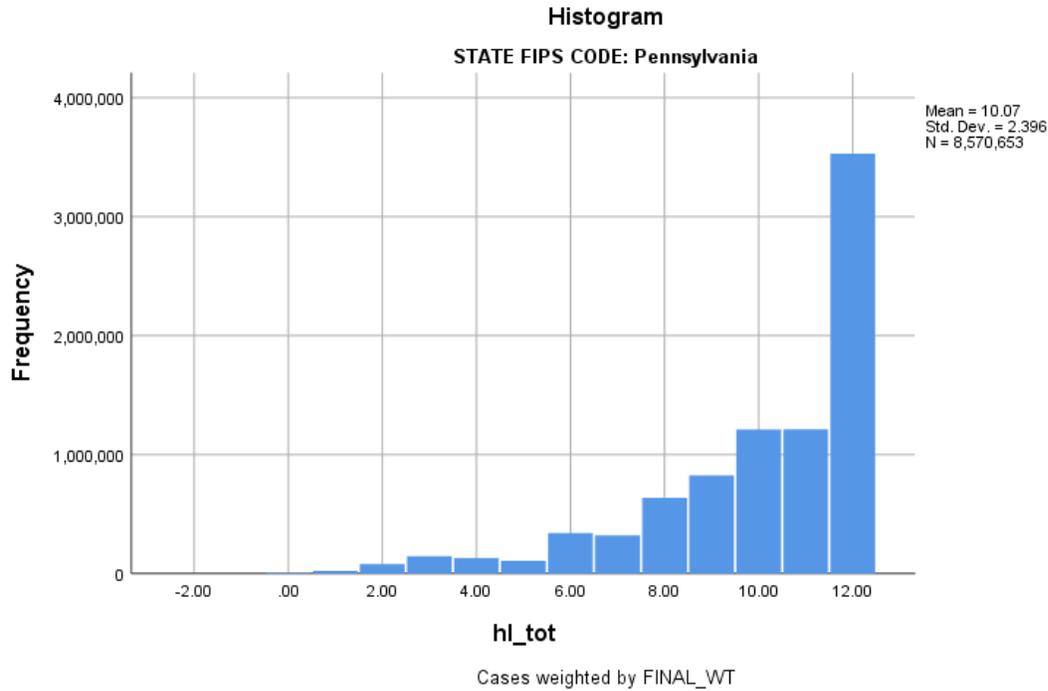
Employment Status [Var:EMPLOY1]

Employed for wages	700052	53.4%	612059	46.6%	0.31	
Self-employed	106914	44.4%	134020	55.6%	0.44	
Out of work for 1 year or more	27159	38.4%	43512	61.6%	0.56	
Out of work for less than a year	29067	34.0%	56361	66.0%	0.68	0.000
A homemaker	86571	45.4%	104264	54.6%	0.42	
A student	48871	42.9%	65170	57.1%	0.47	
Retired	201479	43.0%	266931	57.0%	0.46	
Unable to work	64999	25.9%	185826	74.1%	REF	

Income Level [Var:INCOME2]

Less than \$10,000	44272	30.4%	101242	69.6%	REF	
\$10,000 to 14,999	23844	26.4%	66396	73.6%	1.22	
\$15,000 to 19,999	71659	31.5%	155981	68.5%	0.95	
\$20,000 to 24,999	74864	36.7%	129042	63.3%	0.75	
\$25,000 to 34,999	122270	40.0%	183534	60.0%	0.66	0.000
\$35,000 to 49,999	164031	49.3%	168484	50.7%	0.45	
\$50,000 to 74,999	213525	57.7%	156782	42.3%	0.32	
\$75,000 or more	339663	57.2%	254387	42.8%	0.33	
Don't know/Not sure	74012	28.7%	184072	71.3%	1.09	

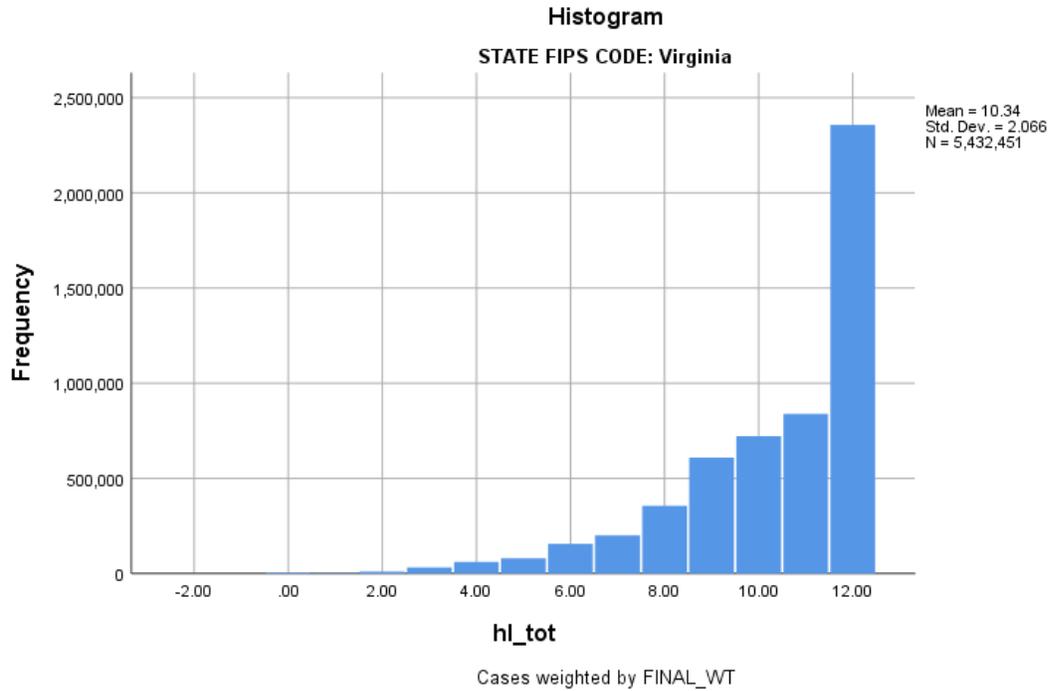
D.15 Pennsylvania HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	p - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	1484412	36.2%	2613179	63.8%	1.48	0.000
Female	2044948	45.7%	2428115	54.3%	REF	
Age [Var:Sex]						
Ages 18 to 24	350480	36.1%	621714	63.9%	1.08	0.000
Ages 25 to 34	525232	42.6%	707626	57.4%	0.82	
Ages 35 to 44	579706	44.7%	716299	55.3%	0.75	
Ages 45 to 54	618575	43.0%	820866	57.0%	0.81	
Ages 55 to 64	690734	42.9%	917570	57.1%	0.81	
Ages 65 or older	764633	37.8%	1257219	62.2%	REF	
Race [var:RACE]						
White	2869884	41.9%	3983096	58.1%	REF	0.000
Black	343833	40.3%	509421	59.7%	1.07	
American Indian or Alaskan Native	18917	38.7%	29924	61.3%	1.14	
Asian, Pacific Islander, Native	61228	35.4%	111929	64.6%	1.32	
Hawaiian						
Hispanic	137975	32.4%	287529	67.6%	1.50	
Multiracial, and other races	51102	48.6%	53942	51.4%	0.76	
Marital Status [Var:MARITAL]						
Married	1968362	44.3%	2473624	55.7%	REF	0.000

Divorced/Widowed/Separated	638364	38.0%	1042459	62.0%	1.30	
Never married	783250	37.8%	1287108	62.2%	1.31	
A member of an unmarried couple	131684	38.3%	212312	61.7%	1.28	
Level of Education Completed						
[Var:EDUCAG]						
Did not graduate High School	209621	20.7%	801703	79.3%	REF	
Graduated High School	1036791	33.1%	2094184	66.9%	0.53	
Attended College or Technical School	1019285	45.4%	1224300	54.6%	0.31	0.000
Graduated from College or Technical School	1255833	58.1%	906388	41.9%	0.19	
Employment Status [Var:EMPLOY1]						
Employed for wages	1877681	45.8%	2221667	54.2%	0.45	
Self-employed	308209	43.1%	407108	56.9%	0.50	
Out of work for 1 year or more	55194	28.1%	141094	71.9%	0.96	
Out of work for less than a year	99500	43.1%	131150	56.9%	0.50	0.000
A homemaker	216055	40.0%	324151	60.0%	0.57	
A student	150442	36.8%	257936	63.2%	0.65	
Retired	642055	37.2%	1082876	62.8%	0.64	
Unable to work	169740	27.4%	450557	72.6%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	89992	27.3%	239126	72.7%	REF	
\$10,000 to 14,999	87344	25.9%	249981	74.1%	1.08	
\$15,000 to 19,999	168807	29.0%	413346	71.0%	0.92	
\$20,000 to 24,999	213394	32.0%	452781	68.0%	0.80	
\$25,000 to 34,999	293664	39.6%	447176	60.4%	0.57	0.000
\$35,000 to 49,999	423514	37.2%	713888	62.8%	0.63	
\$50,000 to 74,999	521574	41.5%	734683	58.5%	0.53	
\$75,000 or more	1407706	56.5%	1083169	43.5%	0.29	
Don't know/Not sure	99444	21.4%	364988	78.6%	1.38	

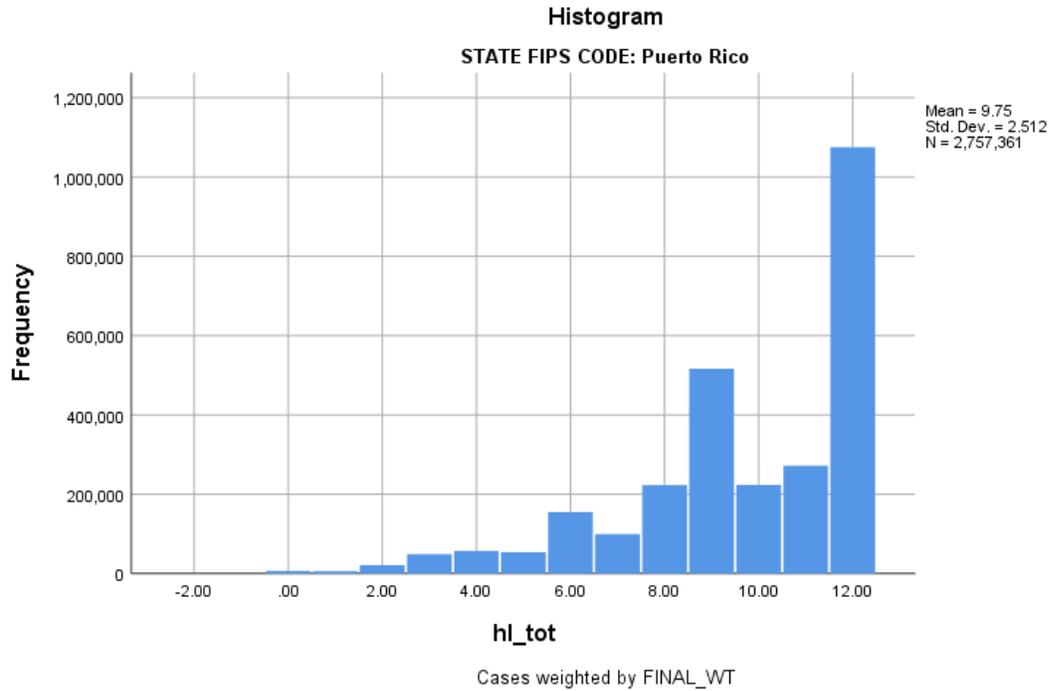
D.16 Virginia HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	<i>p</i> - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	1058861	40.2%	1571962	59.8%	1.28	0.000
Female	1298704	46.4%	1502924	53.6%	REF	
Age [Var:Sex]						
Ages 18 to 24	216295	33.6%	428014	66.4%	1.56	0.000
Ages 25 to 34	322959	38.5%	515689	61.5%	1.26	
Ages 35 to 44	399545	46.4%	462159	53.6%	0.91	
Ages 45 to 54	467444	47.5%	516090	52.5%	0.87	
Ages 55 to 64	453087	46.5%	521471	53.5%	0.91	
Ages 65 or older	498236	44.1%	631464	55.9%	REF	
Race [var:RACE]						
White	1651367	47.1%	1858239	52.9%	REF	0.000
Black	409770	41.8%	571362	58.2%	1.24	
American Indian or Alaskan Native	3750	28.3%	9499	71.7%	2.25	
Asian, Pacific Islander, Native	116309	37.8%	191631	62.2%	1.46	
Hawaiian						
Hispanic	105081	23.9%	334791	76.1%	2.83	
Multiracial, and other races	37049	42.4%	50340	57.6%	1.21	
Marital Status [Var:MARITAL]						
Married	1411309	49.6%	1433839	50.4%	REF	0.000

Divorced/Widowed/Separated	414529	38.3%	667297	61.7%	1.58	
Never married	454584	36.5%	792313	63.5%	1.72	
A member of an unmarried couple	59719	27.4%	157960	72.6%	2.60	
Level of Education Completed						
[Var:EDUCAG]						
Did not graduate High School	123091	18.3%	550843	81.7%	REF	
Graduated High School	489860	34.9%	913062	65.1%	0.42	
Attended College or Technical School	768615	46.6%	882321	53.4%	0.26	0.000
Graduated from College or Technical School	969718	57.6%	713830	42.4%	0.16	
Employment Status [Var:EMPLOY1]						
Employed for wages	1332377	47.8%	1453192	52.2%	0.37	
Self-employed	186505	44.3%	234415	55.7%	0.43	
Out of work for 1 year or more	25288	30.4%	57845	69.6%	0.78	
Out of work for less than a year	29306	29.9%	68567	70.1%	0.80	
A homemaker	111374	38.6%	177333	61.4%	0.54	0.000
A student	102633	32.3%	214849	67.7%	0.71	
Retired	460975	44.8%	568787	55.2%	0.42	
Unable to work	89455	25.4%	262671	74.6%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	31566	19.8%	128048	80.2%	REF	
\$10,000 to 14,999	44938	25.3%	132459	74.7%	0.73	
\$15,000 to 19,999	72012	22.0%	254882	78.0%	0.87	
\$20,000 to 24,999	121884	28.2%	310729	71.8%	0.63	
\$25,000 to 34,999	161756	38.2%	261370	61.8%	0.40	0.000
\$35,000 to 49,999	259228	43.3%	339900	56.7%	0.32	
\$50,000 to 74,999	328481	48.6%	348095	51.4%	0.26	
\$75,000 or more	1039614	57.1%	780120	42.9%	0.18	
Don't know/Not sure	132494	30.7%	299213	69.3%	0.56	

D.17 Puerto Rico HL_{TOT} Results



Demographic Characteristics	Higher Literacy		Lower Literacy		Odds ratio	<i>p</i> - χ^2
	N	%	N	%		
Sex [Var:Sex]						
Male	499784	38.5%	796925	61.5%	1.036	0.000
Female	575398	39.4%	885255	60.6%	REF	
Age [Var:Sex]						
Ages 18 to 24	139596	38.2%	226280	61.8%	.656	0.000
Ages 25 to 34	201961	44.2%	255232	55.8%	.512	
Ages 35 to 44	208727	45.8%	247068	54.2%	.479	
Ages 45 to 54	200499	42.5%	270905	57.5%	.547	
Ages 55 to 64	158728	36.7%	273397	63.3%	.697	
Ages 65 or older	165671	28.8%	409298	71.2%	REF	
Race [var:RACE]						
White	4476	41.8%	6230	58.2%	REF	0.000
Black	496	9.8%	4573	90.2%	n/a	
American Indian or Alaskan Native	0	.0%	0	.0%	n/a	
Asian, Pacific Islander, Native	0	.0%	42	100.0%	n/a	
Hawaiian						
Hispanic	1064373	39.0%	1668154	61.0%	n/a	
Multiracial, and other races	4803	70.0%	2059	30.0%	n/a	
Marital Status [Var:MARITAL]						
Married	412700	39.3%	637299	60.7%	REF	0.000

Divorced/Widowed/Separated	233052	35.8%	418636	64.2%	1.163	
Never married	287250	39.4%	441264	60.6%	.995	
A member of an unmarried couple	138987	44.4%	174121	55.6%	.811	
Level of Education Completed [Var:EDUCAG]						
Did not graduate High School	163323	22.9%	549821	77.1%	REF	
Graduated High School	258955	34.9%	482777	65.1%	.554	
Attended College or Technical School	316310	44.8%	389224	55.2%	.366	0.000
Graduated from College or Technical School	336578	57.4%	249380	42.6%	.220	
Employment Status [Var:EMPLOY1]						
Employed for wages	368733	48.0%	398733	52.0%	.349	
Self-employed	116731	42.8%	155776	57.2%	.431	
Out of work for 1 year or more	95065	43.3%	124279	56.7%	.422	
Out of work for less than a year	26353	34.2%	50689	65.8%	.621	0.000
A homemaker	161558	30.6%	365622	69.4%	.731	
A student	75200	41.2%	107146	58.8%	.460	
Retired	174759	35.9%	312249	64.1%	.577	
Unable to work	51719	24.4%	160193	75.6%	REF	
Income Level [Var:INCOME2]						
Less than \$10,000	206666	29.9%	484565	70.1%	REF	
\$10,000 to 14,999	142228	37.5%	237494	62.5%	.712	
\$15,000 to 19,999	151631	39.2%	235358	60.8%	.662	
\$20,000 to 24,999	124502	42.7%	167344	57.3%	.573	
\$25,000 to 34,999	103764	52.4%	94301	47.6%	.388	0.000
\$35,000 to 49,999	68658	55.4%	55293	44.6%	.343	
\$50,000 to 74,999	41813	57.4%	31031	42.6%	.317	
\$75,000 or more	38664	71.3%	15579	28.7%	.172	
Don't know/Not sure	138620	32.6%	287177	67.4%	.884	

Appendix E

Glossary of Dependent Variable Names

Sex [SEX]

Indicate sex of respondent

Age [AGE]

Reported age in years

Race [_RACE]

Computed race-ethnicity grouping

Level of Education Completed [EDUCAG]

Computed level of education completed categories

Employment Status [EMPLOY1]

Are you currently...?

Income Level [INCOME2]

Is your annual household income from all sources...?

Language [QSTLANG]

Questionnaire language identifier (English, Spanish, other)

General Health Status [GENHLTH]

Would you say that in general your health is...?

Have any health care coverage [HLTHPLN1]

Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service?

Multiple Health Care Professionals [PERSDOC2]

Do you have one person you think of as your personal doctor or health care provider?

Smoke Cigarettes Now [LASTSMK2]

How long has it been since you last smoked a cigarette, even one or two puffs?

Within the past month (less than 1 month ago)

Currently Use Chewing Tobacco, Snuff or Snus [USENOW3]

Do you currently use chewing tobacco, snuff, or snus every day, some days, or not at all? (Snus (Swedish for snuff) is a moist smokeless tobacco, usually sold in small pouches that are placed under the lip against the gum.) [Snus (rhymes with 'goose')]

Every day + Some days

Exercise in Past 30 Days [_TOTINDA]

Adults who reported doing physical activity or exercise during the past 30 days other than their regular job

Adult Flu Shot/Spray Past 12 Months [FLUSHOT6]

Frequency of Seat Belts Use When Driving or Riding in a Car [SEATBELT]

Number of Days Physical Health Not Good [PHYSHLTH]

Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?

Number of Days Mental Health Not Good [MENTHLTH]

Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?

Poor Physical or Mental Health [POORHLTH]

During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?

Doctor Visits Past 12 Months [DRVISITS]

How many times have you been to a doctor, nurse, or other health professional in the past 12 months?

Rate of Alcoholic Beverage Consumption [ALCDAYS]

During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage such as beer, wine, a malt beverage or liquor?

Created composite to equilibrate weight days/week with days in past 30 days

Most Drinks on Single Occasion [MAXDRNKS]

During the past 30 days, what is the largest number of drinks you had on any occasion?

Chronic Disease Burden [CHCCOPD1 + CHCOCNCR + CHCSCNCR + ASTHMA3 + CVDSTRK3 + CVDCRHD4 + CVDINFR4 + HAVARTH3 + ADDEPEV2 + CHCKIDNY + DIABETE3]

(Ever told) you had a heart attack, also called a myocardial infarction?

(Ever told) you had angina or coronary heart disease?

(Ever told) you had a stroke?

(Ever told) you had asthma?

(Ever told) you had skin cancer?

(Ever told) you had any other types of cancer?

(Ever told) you have Chronic Obstructive Pulmonary Disease or COPD, emphysema or chronic bronchitis?

(Ever told) you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia? (Arthritis diagnoses include: rheumatism, polymyalgia rheumatica; osteoarthritis (not osteoporosis); tendonitis, bursitis, bunion, tennis elbow; carpal tunnel syndrome, tarsal tunnel syndrome; joint infection, etc.)

(Ever told) you that you have a depressive disorder, including depression, major depression, dysthymia, or minor depression?

(Ever told) you have kidney disease? Do NOT include kidney stones, bladder infection or incontinence.(Incontinence is not being able to control urine flow.)

(Ever told) you have diabetes?